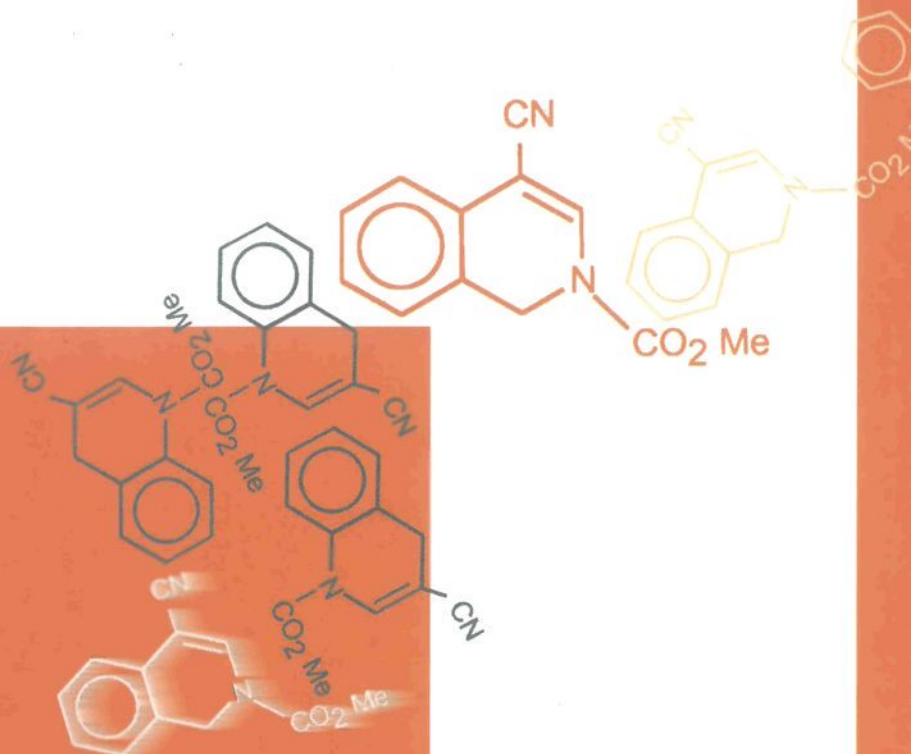


Durga Nath Dhar

Preeti Dhar

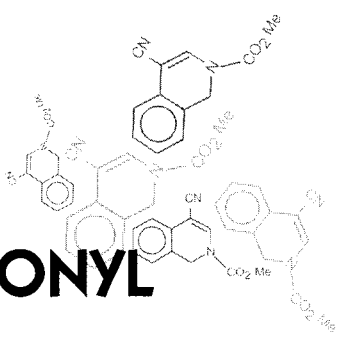


THE CHEMISTRY OF

CHLOROSULFONYL ISOCYANATE

World Scientific

THE CHEMISTRY OF
CHLOROSULFONYL
ISOCYANATE



This page is intentionally left blank



THE CHEMISTRY OF
**CHLOROSULFONYL
ISOCYANATE**

Durga Nath Dhar

Indian Institute of Technology, Kanpur, India

Preeti Dhar

State University of New York, New Paltz, USA



World Scientific

New Jersey • London • Singapore • Hong Kong

Published by

World Scientific Publishing Co. Pte. Ltd.

P O Box 128, Farrer Road, Singapore 912805

USA office: Suite 1B, 1060 Main Street, River Edge, NJ 07661

UK office: 57 Shelton Street, Covent Garden, London WC2H 9HE

British Library Cataloguing-in-Publication Data

A catalogue record for this book is available from the British Library.

THE CHEMISTRY OF CHLOROSULFONYL ISOCYANATE

Copyright © 2002 by World Scientific Publishing Co. Pte. Ltd.

All rights reserved. This book, or parts thereof, may not be reproduced in any form or by any means, electronic or mechanical, including photocopying, recording or any information storage and retrieval system now known or to be invented, without written permission from the Publisher.

For photocopying of material in this volume, please pay a copying fee through the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, USA. In this case permission to photocopy is not required from the publisher.

ISBN 981-238-081-7

This book is printed on acid-free paper.

Printed in Singapore by Uto-Print

**Dedicated to the
Memory of
Professor Derek Barton**

This page is intentionally left blank

Preface

Chlorosulfonyl isocyanate, CSI, was discovered by Graf in 1952. Since that time it has become a subject of increasing interest and importance. It has served as a precursor for the synthesis of a variety of useful products such as pharmaceutical compounds, herbicides, pesticides, liquid crystals, sweetener intermediates, and bleaching catalysts for detergents.

In this book we have woven the work of CSI investigators (references covering the period upto August 2001, through the Chemical Abstracts) into a unified treatment for researchers interested in the chemistry of chlorosulfonyl isocyanate. The book is divided into two parts. Part I deals with reactions and Part II focuses on applications. Introductory remarks about CSI, its properties, and the method of its synthesis are incorporated before Part I. This is followed by the outlines of the reactions of CSI with a wide variety of substrates. We have presented the substrates according to the established format, viz., aromatic and alicyclic hydrocarbons, alkenes (mono-, di-, tri- and tetra substituted), dienes (conjugated and unconjugated) including allenes, tri- and tetraenes (conjugated and unconjugated), conjugated pentaenes, alkynes, alcohols, vic. diols, thioalcohols, phenols, ethers, carbonyl compounds (and their derivatives), amines and their derivatives, and the substrates containing silicon, nitrogen, phosphorus, oxygen and sulfur atom(s). Amongst polyfunctional substrates only one functional group has been arbitrarily chosen as the basis of their classification.

In part I, sequential numbers are assigned to each reaction to provide access to these through the author index I. Index is referenced to these numbers rather than to page numbers. The table of contents is organized to serve as a subject index.

The significant applications of CSI in the preparation of useful

products is the theme of part II. The data reported therein have been carefully extracted from the published patent literature. The material on the subject has been classified under the following headings: Herbicides, Pesticides and Insecticides, Anti-viral and Anticancer Compounds, Biologically Active Compounds, Antibiotics and Miscellaneous Category of Compounds. References are given to original papers and patent literature, and are accompanied with Chemical Abstracts (CA) references. An author Index (part II) is provided.

Literature references are reported in the conventional manner and journal abbreviations correspond (with a few exceptions, *vide infra*) to those adopted by the American Chemical Abstracts. Some important journals have been abbreviated, as for example, Journal of the American Chemical Society (referred to as JACS), Journal of Organic Chemistry (JOC), Journal of Chemical Society Chemical Communications (JCS Chem. Comm.) and Liebig's Annalen der chemie as 'Ann.'

In the event of our omission or citation with less emphasis than deserved, we ask for your indulgence and tolerance. In spite of shortcomings, if any, we hope that this book will not only be a source of information, but it will also serve as a stimulus for more creativity in synthesis involving the use of chlorosulfonyl isocyanate.

Acknowledgements

The writing of the book was financed by a generous grant, received from the U.P. Council of Science & Technology, (CST), Lucknow, and we gratefully acknowledge the same. In particular we thank Dr. A.N. Pathak, Director, CST, for evincing keen interest in the progress of the project.

We appreciate the help of DND's former students who have assisted in various ways. They are Prof. Anil Kumar Singh of IIT Mumbai, Dr. Sajan P. Joseph of Eli Lilly Research Laboratories, Indiana, USA., and Dr. Pramod Kumar of Lupin Laboratories, Bhopal. We thank Dr. Mridula Saxena for literature searching and proof reading, Namita Sumbli for editing, and Dr. Amrika Singh for checking the references.

A personal gratitude is due to Roopa Dhar and Surinder Tikoo, whose support and encouragement in the most critical moments was a real source of strength. We also thank Pankaj, Sonali, and Ravinder for their patience and understanding.

Durga Nath Dhar

Preeti Dhar

Lucknow, India
New Paltz, USA

This page is intentionally left blank

Contents

Dedication	v
Preface	vii
Acknowledgements	ix
Introduction	1
Properties	1
Synthesis	2
References	2
Part I	
CSI Reactions	5
CSI Reactions	7
Aromatic Hydrocarbons	7
Cycloalkanes	7
Mono-Substituted Alkenes	10
1, 1 - Disubstituted Alkenes	14
1, 2 - Disubstituted Alkenes	22
Tri-Substituted Alkenes	38
Tetra-Substituted Alkenes	48

Conjugated Dienes	51
Unconjugated Dienes	60
Allenes	67
Conjugated Trienes	77
Unconjugated Trienes	79
Conjugated Tetraenes	82
Unconjugated Tetraenes	84
Conjugated Pentaenes	86
Acetylenes	87
Alcohols	91
<i>Vic.</i> Diols	104
Thioalchols	105
Phenols	105
Ethers/Epoxides	109
Peroxide	114
Ketenes	115
Thioketenes	115
Aldehydes	116
Acetals	118
Ketones	119
Ketals	133
Diketones	134

Triketones	134
Acids	135
Esters	139
Thioesters	142
Amides	144
Sulfonamides	149
Chlorinating Agent	153
Acid Chloride	153
Amino and Imino Compounds	154
Nitrogen Compounds	167
Azaridines/Azirines	167
Nitrogen Heterocycles	170
Compounds Containing \geq N -	176
Compounds Containing - N = O	182
Cyanides	183
Diazo, Azido Compounds	184
Oxygen Heterocycles	185
Sulfur Containing Compounds	187
Sulfur Heterocycles	192
Organo-Silicon Compounds	193
Organo-Phosphorus Compounds	195
Miscellaneous Reactions	196

Part II		
CSI Applications	199	
II-1	Herbicides, Plant Growth Regulators/Inhibitors and Plant Protection Agents	201
II-2	Pesticides, Insecticides and Fungicides	228
II-3	Anti-viral, Anti-cancer and Anti-HIV Compounds	233
II-4	Biological Activities	239
	Analgesics/anti-inflammatory compounds	239
	Anti-allergics	246
	Anti-proliferative/anti-tumor agents	247
	Neuroleptics	248
	Anti-convulsants	250
	Anti-degenerative agents	251
	Anti-coagulants	252
	Blood related problems	256
	Platelet aggregation, induction/inhibition	256
	Hypoglycemics	256
	Brain related problems	258

Eye disorders	258
Heart related disorders	259
Disorders of stomach & gastro-intestinal tract	262
Bioartificial insulin distributor membranes	263
Bronchial asthma	263
CNS related disorders	264
Lipid/cholesterol lowering agents	264
Antibiotics	265
Growth hormone release promoters	267
Antagonists	269
Inhibitors	271
Chelation & diagnostics	276
Miscellaneous activities	277
II-5 Antibiotics	279
Azetidinones	279
Azabicyclo [3.2.0] heptenones	286
Carbapenems	291
Cephalosporins	296
Cephems	302
Beta Lactams	305

Penems	306
Penicillins	308
Thenamycins	309
Miscellaneous antibiotics	311
II- 6 Miscellaneous Applications	317
Author Index I	323
Author Index II	339
References	355

Introduction

The reagent-Chlorosulfonyl isocyanate (CSI) was discovered by Graf in Germany in the early fifties. Since that time it has generated widespread research interest and a number of publications, including several review articles¹⁻⁸, on CSI have appeared in the literature.

Chlorosulfonyl isocyanate, ClSO_2NCO , formula weight 141.5, is also known as N-Carbonyl sulfamoyl chloride.

Properties

- Clear, colourless, mobile liquid.
- Melting point, -43°C .
- Boiling point, $107 - 108^\circ/760 \text{ mm}$ ($38^\circ/50\text{mm}$).
- Density, d_4^{20} , 1.626.
- Refractive index, n_D^{27} 1.4435.
- Infrared spectrum shows characteristic absorption due to :
 $\nu_{\text{as}} - \text{N} = \text{C} = \text{O}$, 2240 - 2220 cm^{-1}
 $\nu_{\text{as}} \text{SO}_2$, 1390 - 1370 cm^{-1} .
 $\nu_{\text{as}} \text{SO}_2$, 1190 - 1180 cm^{-1} .
- The dihedral angle of gauche conformer of $\text{Cl-S} - \text{N} = \text{C}$ is 94° ($\sim 98^\circ$) and that NCO group is not linear for the lowest energy conformer of CSI (based on micro-wave spectroscopic data).^{9, 10}
- Thermally stable upto 300°C .
- It possesses a choking smell.
- Fumes on exposure to humid air, and reacts violently with water.
- The following can be employed as solvents/diluents in reactions involving the use of CSI:

CH_2Cl_2 , CHCl_3 , CCl_4 , $\text{C}_6\text{H}_5\text{Cl}$, Et_2O , $(\text{C}_3\text{H}_7^i)_2\text{O}$, CH_3CN and

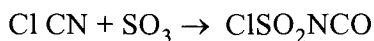
and $\text{SO}_3(\text{l})$. Me_2CO and MeCO_2Et may also be employed as solvents for CSI, to a limited extent, but at low temperatures.

Caution

If CSI accidentally comes in contact with skin, the area should be immediately flushed with a large quantity of water.

Synthesis

The first synthesis of chlorosulfonyl isocyanate was reported by Graf,^{11,12} and consists the interaction of equimolecular quantities of cyanogen chloride and sulfur trioxide:



In this connection a spate of attempts¹³⁻¹⁸ have been reported essentially based on the above reaction, but under different experimental conditions. The highest yield of Chlorosulfonyl isocyanate (87%) has been reported in a Japanese patent¹⁴.

References

1. Ulrich, H., *Chem. Revs.* **65**, 369 (1965).
2. Graf, R., *Angew. Chem. Int. Ed.*, **7**, 172 (1968).
3. Rasmussen, J.K. and Hassner, A., *Chem. Revs.* **76**, 389 (1976).
4. Szabo, W.A., *Aldrichimica Acta*, **10**, 23 (1977).
5. Dhar, D.N., and Keshava Murthy, K.S., *Synthesis*, 437 (1986).
6. Kamal, A. and Sattur, P.B., *Heterocycles*, **26**, 1051 (1987).
7. Liu, Z., Chen, D., *Huaxue Shiji*, **11**, 26 (1989), *C.A.* **111**, 77460¹ (1989).
8. Yang, X., Li, Z., *Hecheng Huaxue*, **4**, 31 (1996). *C. A.* **125**, 221381 (1996).
9. Jo, O.L., Graybeal, J.D., Lovas, F.J., Suenram, R.D., *J. Mol. Spectros.* **152**, 261 (1992).
10. Durig, J.R., Zhou, L., Gaunev, T.K., Guirgis, G.A. *Spectrochim Acta*, **53** (A), 1581 (1997).
11. Graf, R., *Chem. Ber.*, **89**, 1071 (1956).

12. Graf, R., German Patent 928, 896, *C. A.* **51**, 4419 (1957).
13. Niermann, H., Diskowski, H., Roszinski, H., Tiedermann, J., Martin, W. (Hoechst A.G.) *Eur. Patent Appl.* EP 294, 613, DE Appl. 3, 719, 305, *C. A.* **111**, 9240^w (1989).
14. Nakamura, A., Ono, M., Ataka, T., Noguchi, S., Shirakawa, H., Segawa, H., Japan Kokai Tokkyo Koho JP 01, 228, 955, *Chem. Abstr.* **112**, 79957^e (1990).
15. Nakamura, A., Ono, M., Ataka, T., Japanese Patent JP 01463063, *C. A.* **117**, 17079^j (1992).
16. Schlegel, G., Lachhein, S., Berger, H., *Eur. Pat. Appl.* EP 501, 369. *C. A.*, **118**, 8613^c (1993).
17. Cieslewski, T., Chuck, R., Gross, M., Galli, M.P., Swiss Patent CH 680, 292, *C. A.*, **118**, 236411^r (1993).
18. Ogawa, T., Yano, K., (Sumitomo Chemical Co., Ltd., Japan), Japanese patent JP 2000053630, *C.A.* **132**, 167972, (2000).

This page is intentionally left blank

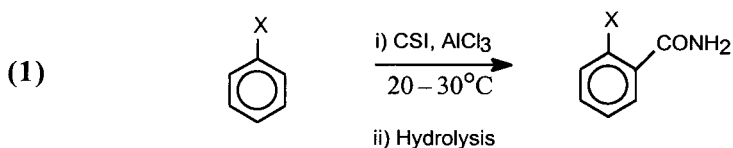
Part I
CSI Reactions

This page is intentionally left blank

CSI Reactions

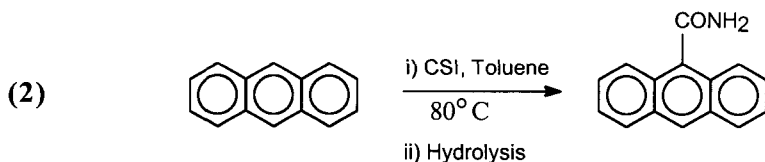
Aromatic Hydrocarbons

Reaction Number



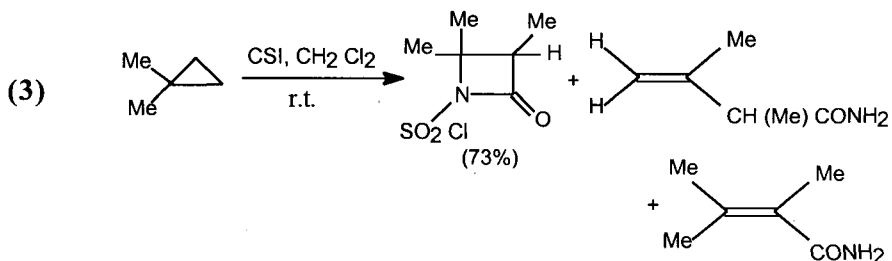
Graf, R., (Farbwerke Hoechst A.G.), German Patent 1010958, *Chem. Zbl.*, 2569 (1958).

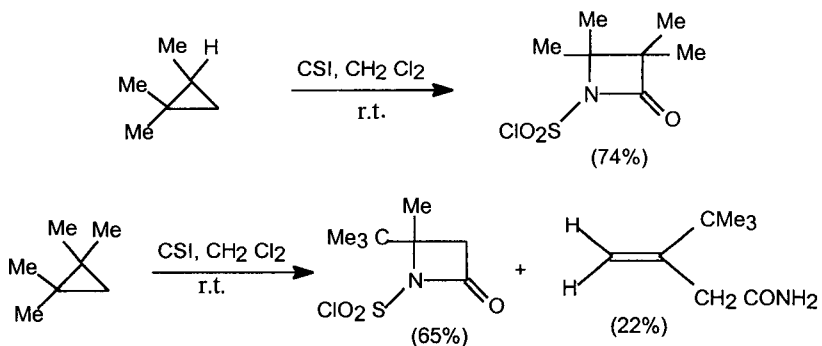
(Farbwerke Hoechst A.G.), German Patent 1002331, *Chem. Zbl.*, 10336 (1957). *Chem. Ber.*, **92**, 509 (1959).



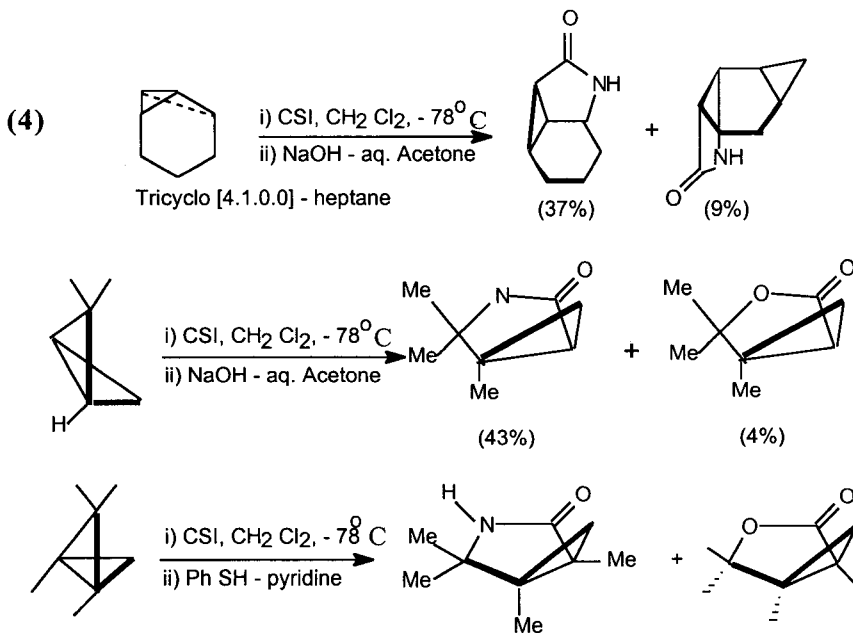
Graf, R., *Ann.*, **661**, 111 (1963)., German Patent 941, 847., C.A. **51**, 14789 (1957).

Cycloalkanes

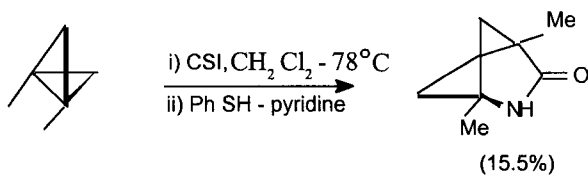


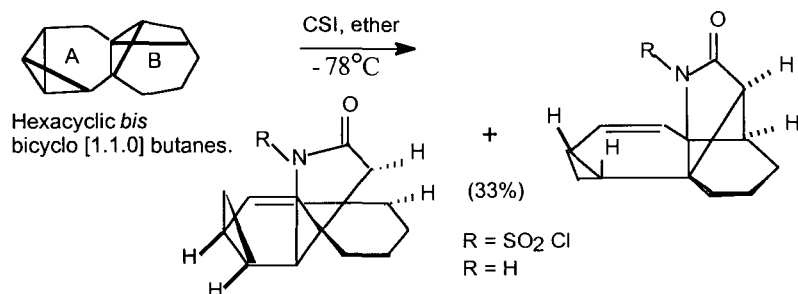
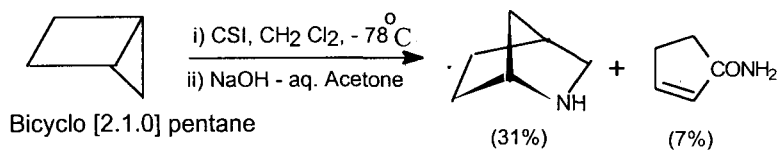


Moriconi, E.J., Kelly, J.F., Salomone, R.A., *JOC*, **33**, 3448 (1968).



Methyl-substituted bicyclo[1.1.0]butanes

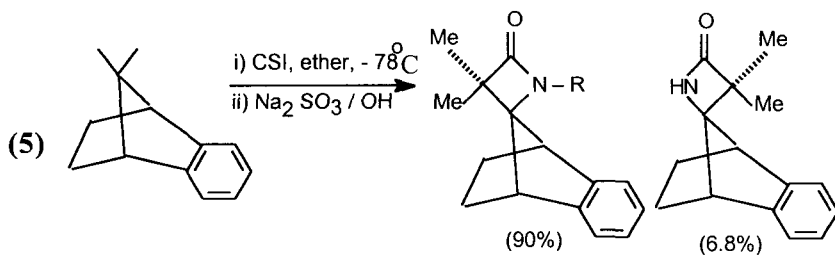




Paquette, L.A., Allen (Jr.) G.R., Broadhurst, M.J., *JACS*, **93**, 4503 (1971).

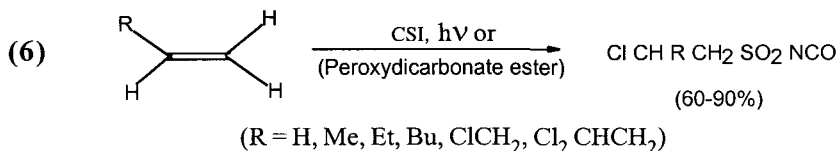
Paquette, L.A., Lau, C.J., Rogers, R.D., *JACS*, **110**, 2592 (1988).

Borror, A.L., Chinoporos, E., Filosa, M.P., Herchen, S.R., Petersen, C.P., Stern, C.A., Onan, K.D., *JOC*, **53**, 2047 (1988).



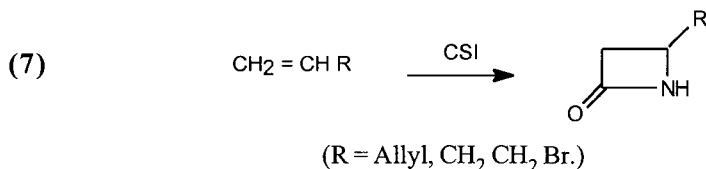
Sasaki, T., Hayakawa, K., Manabe, T., Nishida, S., *JACS*, **103**, 565 (1981).

Mono-Substituted Alkenes

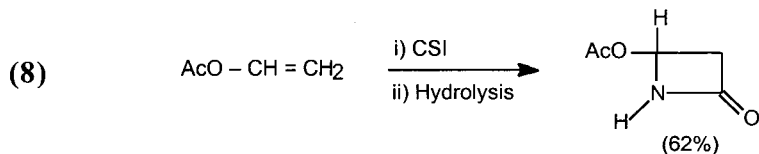


Wegener, P., Riemenschneider, W., Ulmschneider, D., (Hoechst A.G.),
Eur. Pat. Appl. E.P. 53, 331, C.A. **97**, 144359^z (1982).

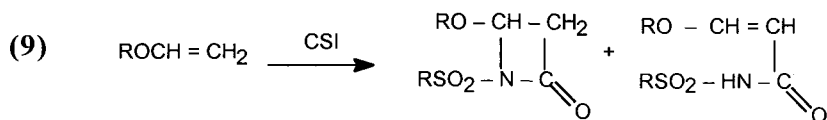
Gunther, D., Soldan, F., *Chem. Ber.* **103**, 663 (1970).



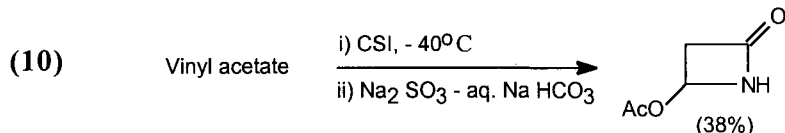
Pfaendler, H.R., Rudolf, S., *Ann.*, 911 (1987).



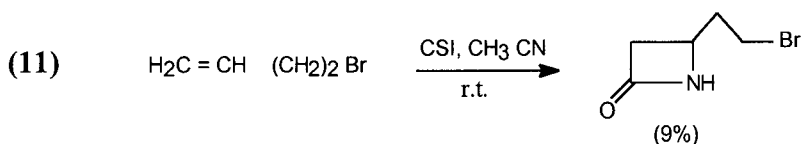
Mickel, S.J., Hsiao, C.N., Miller, M.J., *Org. Synth.* **65**, 135 (1987).



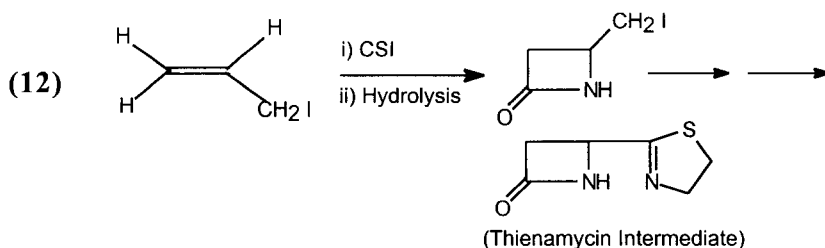
Effenberger, F., Gleiter, R., *Chem. Ber.*, **97**, 1576 (1964)



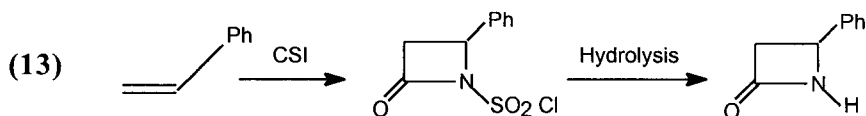
Crombie, L., Haigh, D., Jones, R.C.F., Matzin, Ab. R., *JCS Perkin Trans.*



Pfaendler, H.R., Strasser, R., *Ann.*, 911 (1987).

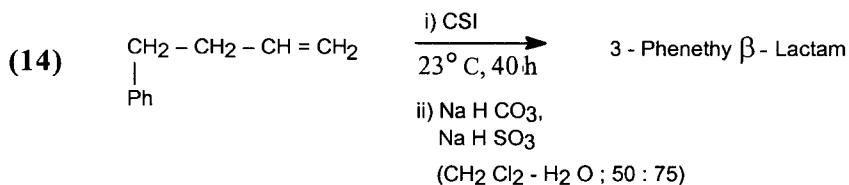


Tanaka, T., Miyavdera, T., *Heterocycles*, **19**, 1497 (1982).

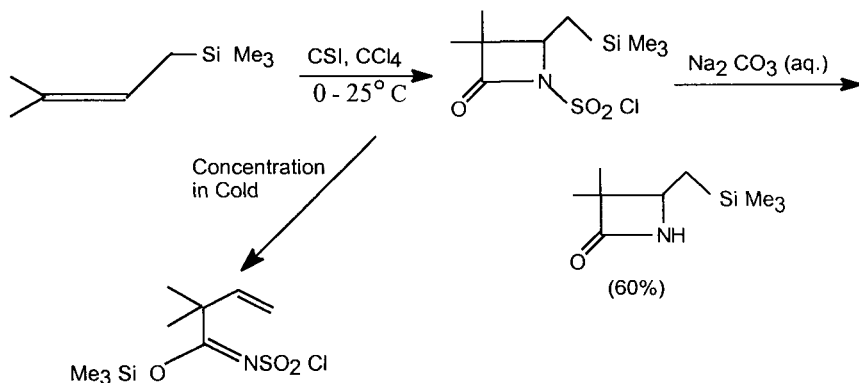
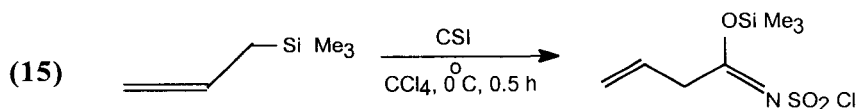


Begley, M.J., Crombie, L., Raymond, D.H., Jones, C.F., Osborne, S., Webster, R.A.B., *JCS Perkin Trans. I*, 2027 (1993).

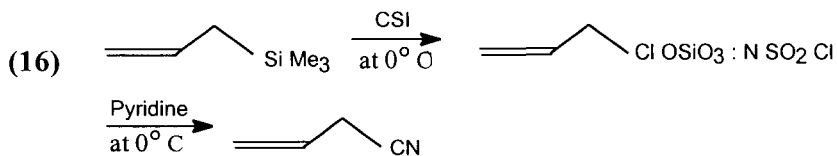
Vorbruggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



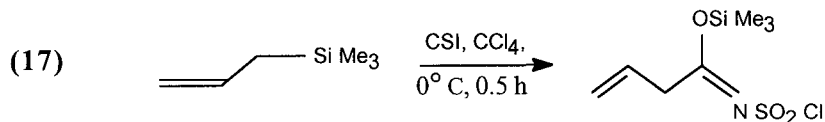
Zablocki, J.A., Tjoeng, F.S., Bovy, P.R., Miyano, M., Garland, R.B., Williams, K., Schretzman, L., Zupec, M.E., Rico, J.G., Lindmark, R.J., Toth, M.V., Mc Mackins, D.E., Adams, S.P., Panzerknodle, S.G., Nicholson, N.S., Taite, B.B., Salyers, A.K., King, L.W., Campion, J.G., Feigen, L.P. *Bio-organic & Med. Chem.*, **3**, 539 (1995).



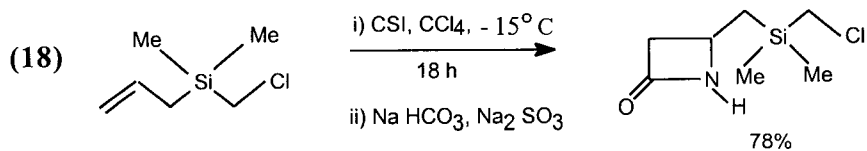
Colvin, E.W., Monteith, M., *JCS Chem. Comm.*, 1230 (1990).



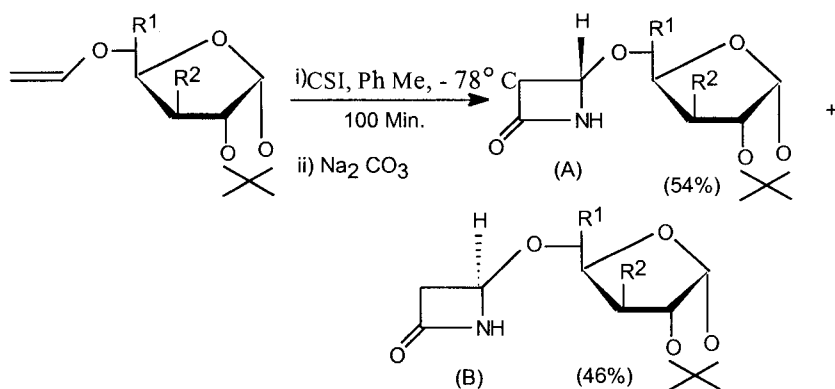
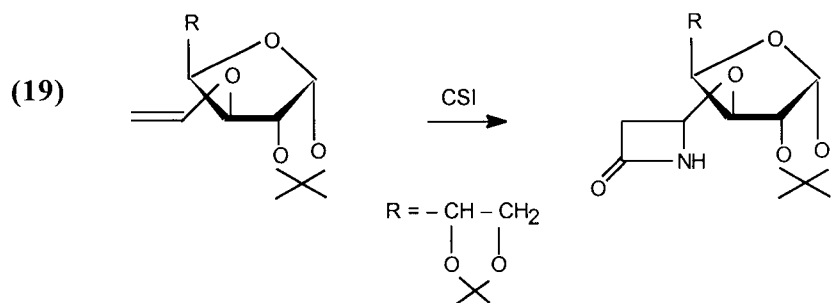
Deleris, G., Dunogues, T., Calas, R., *J. Organomet. Chem.*, **116**, C45-C48 (1976).



Colvin, E.W., Monteith, M., *JCS Chem. Comm.*, 1230 (1990).



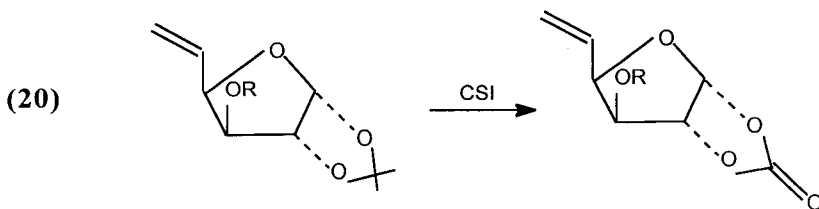
Gehanne, S., Giammaruco, M., Taddei, M., Ulivi, P., *Tet. Lett.*, **35**, 2047 (1994).



Example compound:

R¹ = CH₂ OTIBS; R² = OBzh.

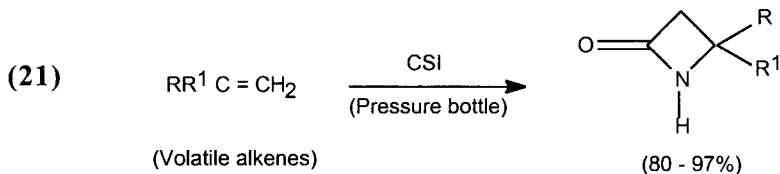
Kaluza, Z., Furman, B., Chmielewski, M., *Tet. Asymm.*, **6**, 1719 (1995).



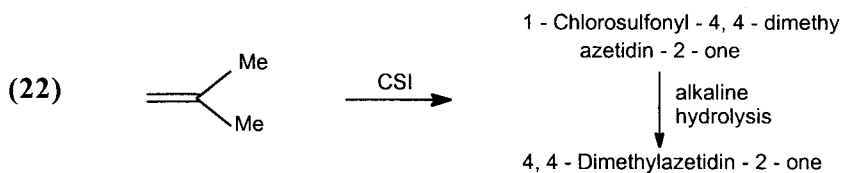
Hall, R.H., Jordaan, A., Lourens, G.J., *JCS Perkin Trans. I*, 38 (1973).

Hall, R.H., Jordaan, A., De Villiers, O.G., *JCS Perkin Trans. I*, 626 (1975).

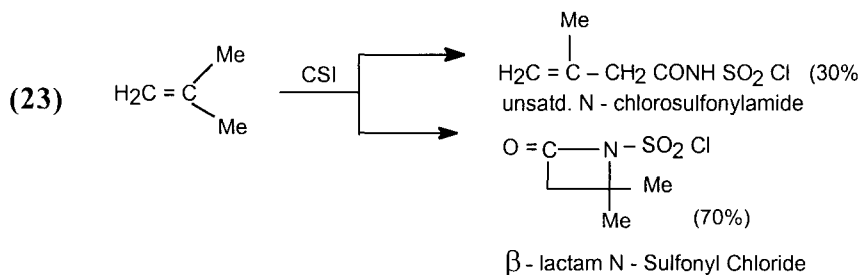
1, 1- Disubstituted Alkenes



Hauser, F.M., Ellenberger, S.R., *Synthesis*, 324 (1987).



Black, D.S.C., Boscacci, A.B., *Aust. J. Chem.*, **30**, 1109 (1977).



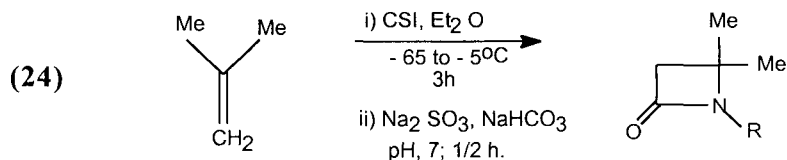
Graf, R., (Farbwerke Hoechst A.G.), German Patent 941847, (1953), *Chem. Zbl.* 1297 (1957).

(Farbwerke Hoechst A.G.), German Patent 1119277, (1958), *Chem., Zbl.* 27-2304 (1964).

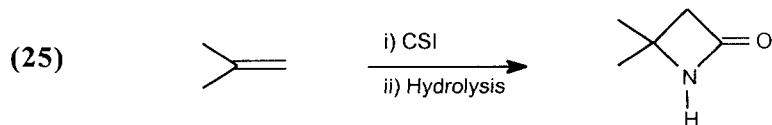
Ann. **661**, 111 (1963)

Org. Synth., **46**, 51 (1966).

Clauss, K., *Tet. Lett.*, **15**, 1271 (1974).

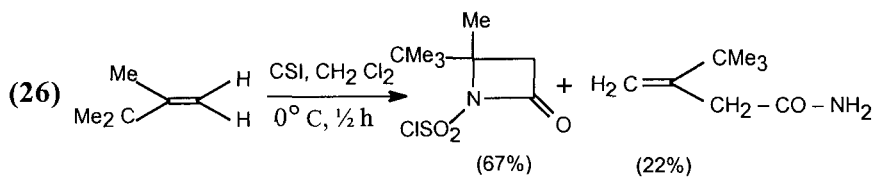


Schoen, W.R., Pissano, J.M., Prendergast, K., Wyvratt, (Jr.), M.J., Fischer, M.H., Cheng, K., Chan, W.W.S., Butler, B., Smith, R.G., Ball, R.G., *J. Med. Chem.*, **37**, 897 (1994).

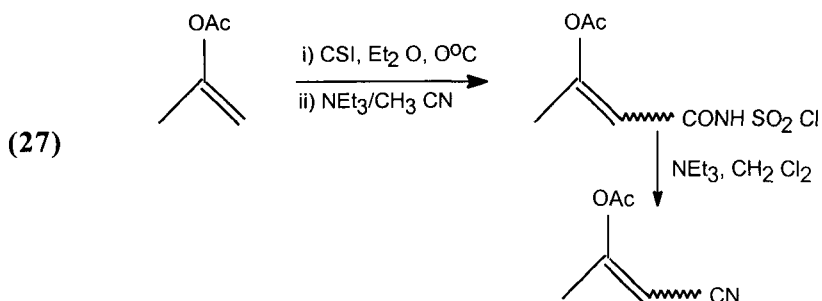


Espie, J.C., Rassat, A., *Bull. Soc. Chim. Fr.*, 4385 (1971).

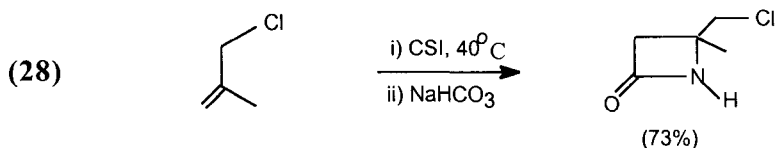
Espie, J.C., Ramasseul, R., Rassat, A., *Tet. Lett.*, **19**, 795 (1978).



Moriconi, E.J., Kelly, J.F., Salomone, R.A., *JOC*, **33**, 3448 (1968).

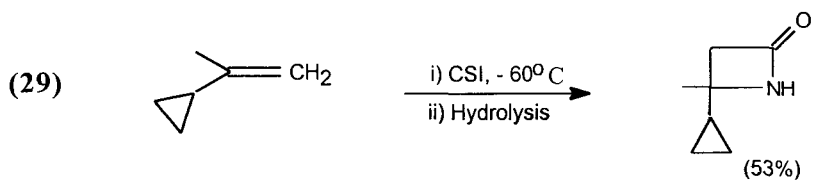


Vorbrüggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).

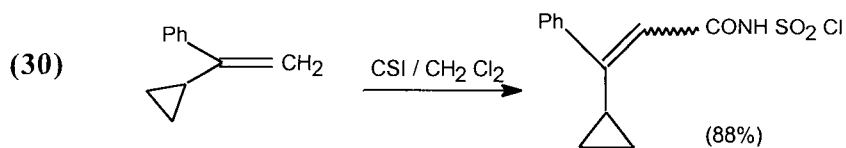


Methallyl Chloride

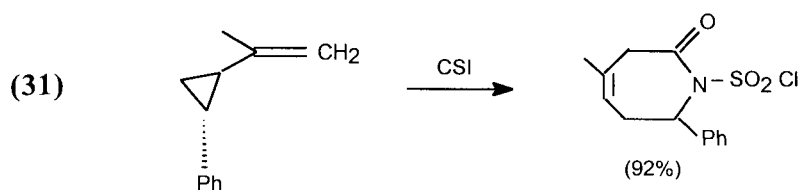
Clauss, K., *Tet. Lett.*, **15**, 1271 (1974).



Barton, T.J., Rogido, R.J., *JCS Chem. Comm.*, 878 (1972).



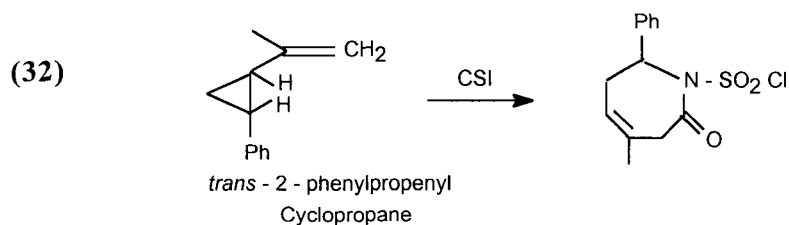
Bentel, P., Adolphi, H., Kiehs, K., *Ger. Offen.*, **2**, 249, 939 (1974); C.A. **81**, 13108^b (1974).



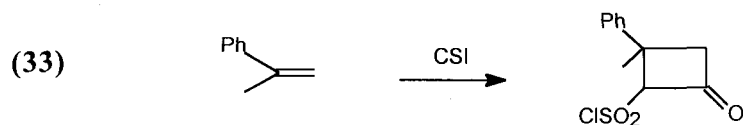
Isaacs, N.S., *Chem. Soc. Revs.*, **5**, 181(1976).

Bertian, H., *Pure Applied Chem.*, **27**, 611(1971).

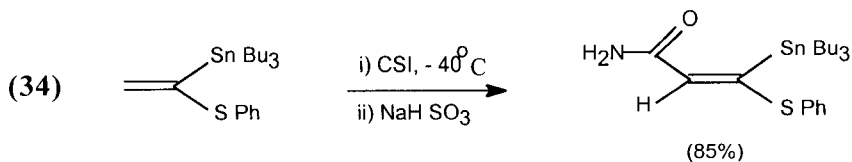
Ulrich, H., "Cycloaddition Reactions of Heterocumulenes" Academic Press, Inc., New York, NY., pp. 135 - 141 (1967).



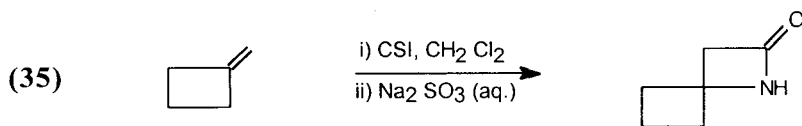
Pasto, D.J., Chen., A.F. - T., *Tet. Lett.*, **14**, 713 (1973).



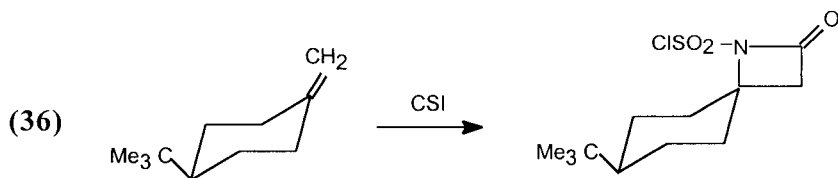
Graf, R., *Ann.*, **611**, 111 (1963).



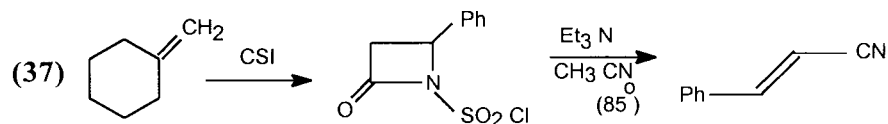
Imanieh, H., MacLeod, D., Quayle, P., *Tet. Lett.*, **30**, 2689 (1989).



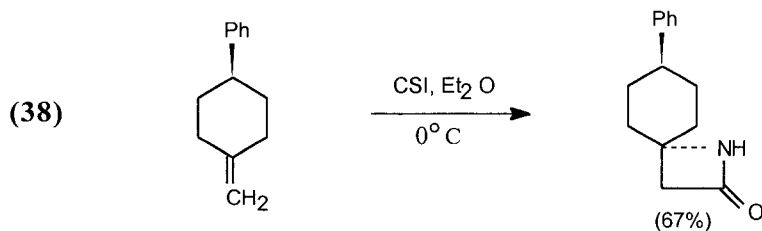
Aue, D.H., Iwahashi, H., Shellhamer, D.F., *Tet. Lett.*, **14**, 3719 (1973).



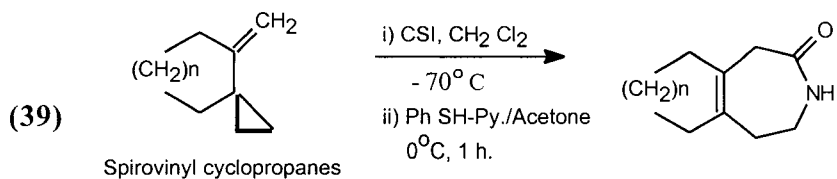
Dunkelblum, E., *Tetrahedron*, **32**, 975 (1976).



Vorbrüggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).

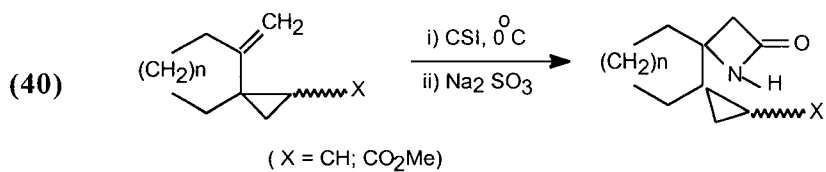


Barret, A.G.M., Betts, M.J., Fenwick, A., *JOC*, **50**, 169 (1985).

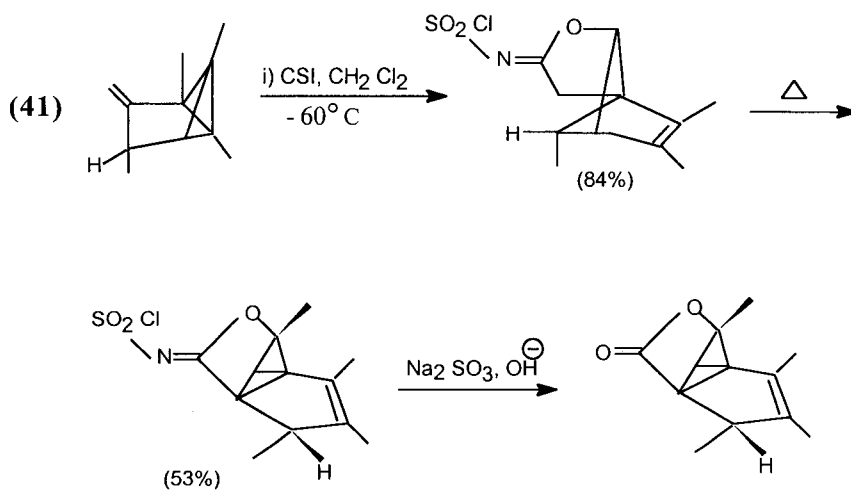


Sarel, S., Felzenstein, A. Yovell, J., *Tet. Lett.*, **17**, 451 (1976).

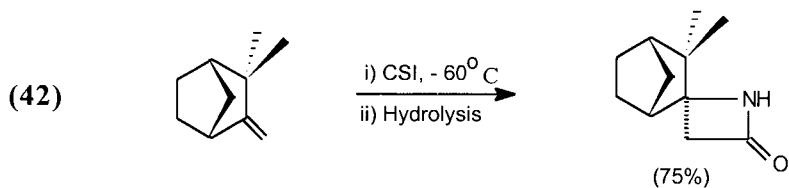
Langbeheim, M., Sarel, S., *Tet. Lett.*, **19**, 2613 (1978).



Langbeheim, M., Sarel, S., *Tet. Lett.*, **19**, 2613 (1978).

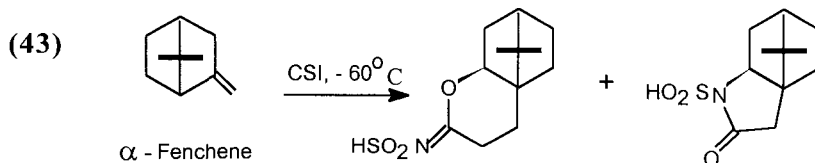


Hogveen, H., Zwart, L., *JOC*, **44**, 1365 (1979).

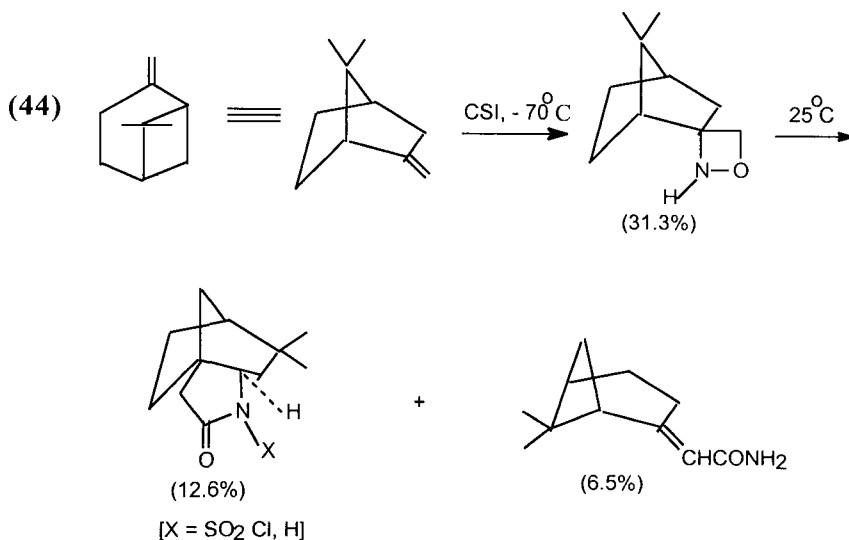


Malpass, J.R., Tweedle, N.J., *JCS Chem. Comm.*, 1244 (1972).

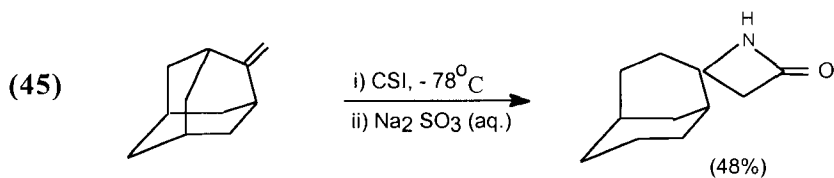
Sasaki, T., Eguchi, S., Yamada, H., *JOC*, **38**, 679 (1973).



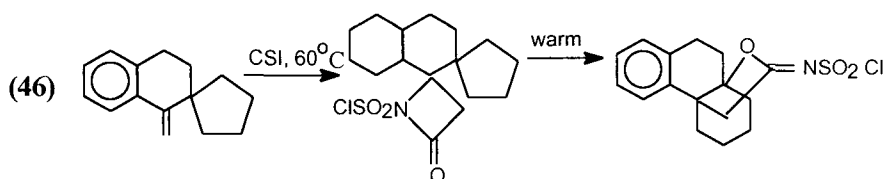
Malpass, J.R., Tweedle, N.J., *JCS Chem. Comm.*, 1244 (1972).



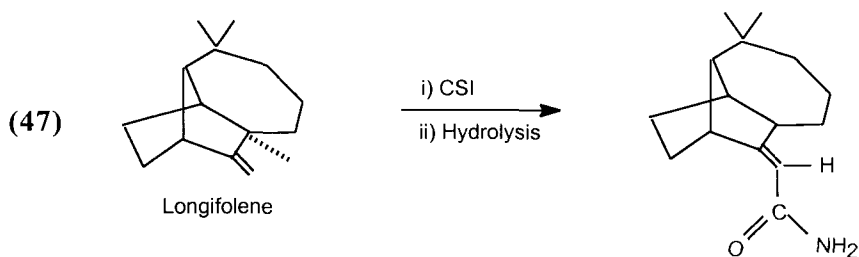
Sasaki, T., Eguchi, S., Yamada, H., *JOC*, **38**, 679 (1973).



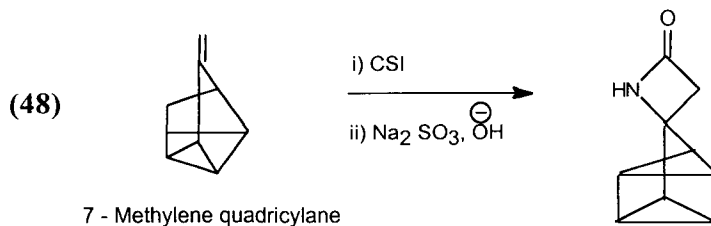
Sasaki, T., Eguchi, S., Hirako, Y., *Tetrahedron*, **32**, 437 (1976).



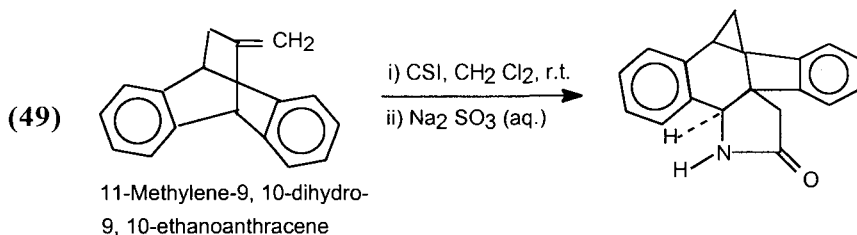
Doyle, T.W., Conway, T.T., *Tet. Lett.*, **10**, 1889 (1969).



Mehta, G., Dhar, D.N., Suri, S.C., *Ind., J. Chem.*, **16B**, 87 (1978).

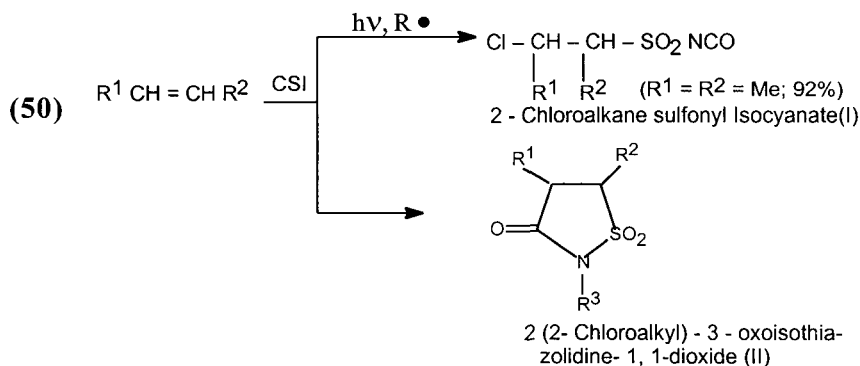


Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).



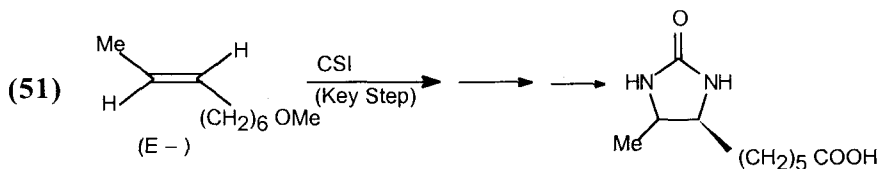
Ciganek, E., *JOC*, **45**, 1505 (1980).

1, 2 - Disubstituted Alkenes

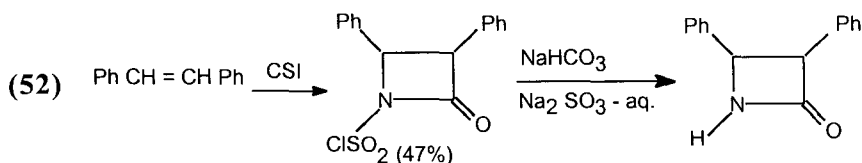


I			II			
R^1	R^2	Yield (%)	R^1	R^2	R^3	Yield (%)
H	H	84	H	H	$CH_2 CH_2 Cl$	75
Me	H	90	Me	H	$CH_2 C(Me)Cl$	80
Et	H	70	C_4H_9	H	$CH_2 CH Cl C_4 H_9$	62
C_4H_9	H	63				
Cl	H	11				
$CH_2 Cl$	H	73				
$CH_2 Cl Cl_2$	H	60				
$Cl_2 CH CH_2 CH Cl Cl_2$	H	3				

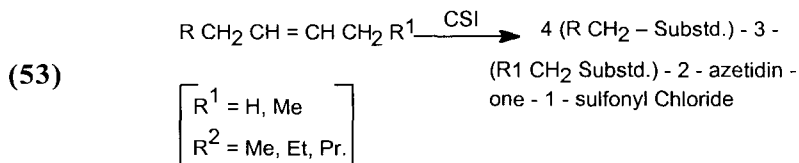
Gunther, D. and Soldan, F., *Chem. Ber.*, **103**, 663 (1970).



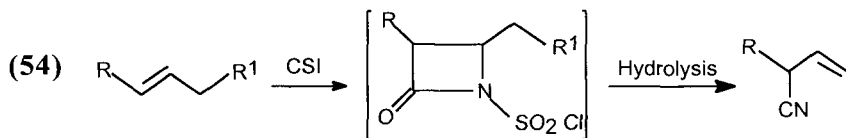
Jouany, M., Coustal, S., Frappier, F., Marquet, A., *J. Chem. Res. Synop. J.*, 114 (1982).



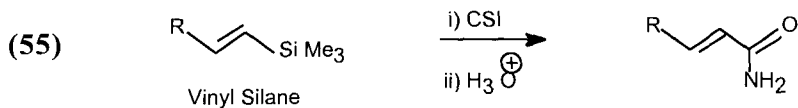
Friedrich, H.J., *Tet. Lett.*, **12**, 2981 (1971).



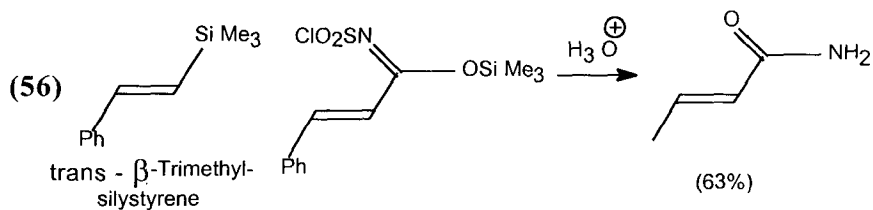
Bestian, H., Biener, H., Clauss, K., Heyn, H., *Ann.*, **718**, 94 (1968).



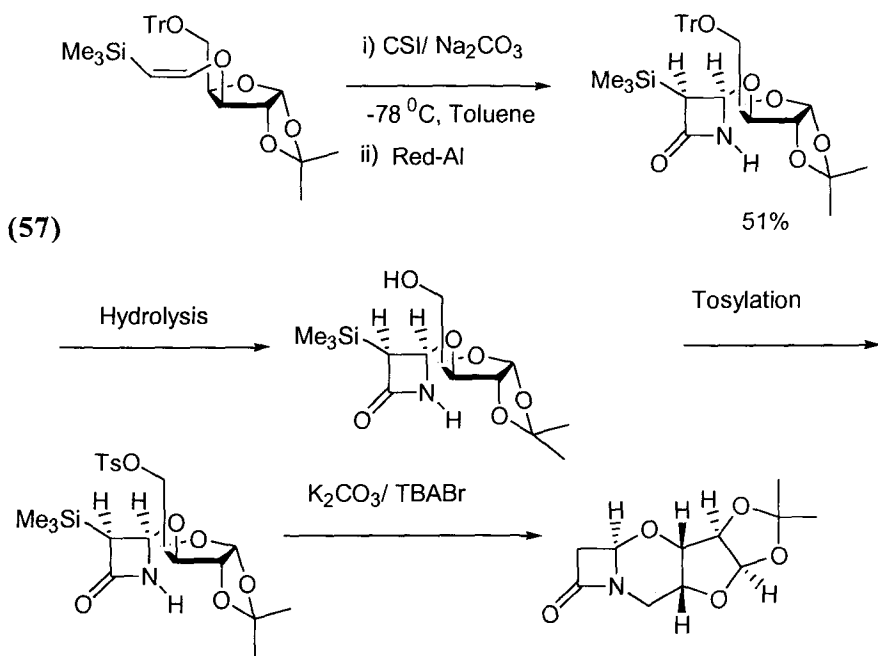
Nativi, C., Perrotta, E., Ricci, A., Taddei, M., *Tet. Lett.*, **32**, 2265 (1991).



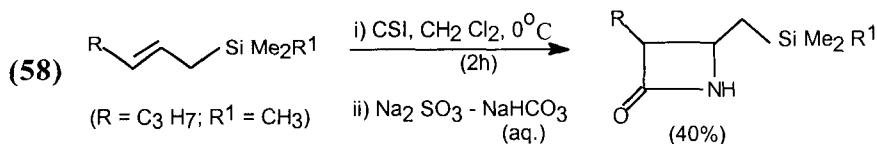
Page, P.C.B., Rosenthal, S., Williams, R.V., *Synthesis*, 621 (1988).



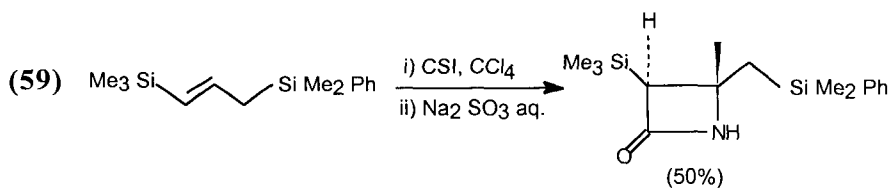
Barton, T.J., Rogido, R.J., *JOC*, 40, 582 (1975).



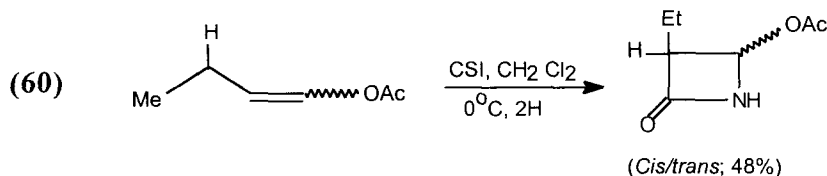
Lysek, R., Kaluza, Z., Furman, B., Chmielewski, M., *Tetrahedron*, 54, 14065, (1998).



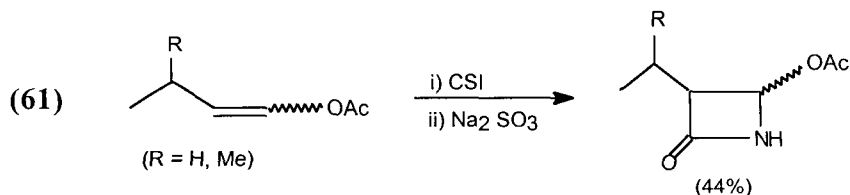
Nativi, C., Perrotta, E., Ricci, A., Taddei, M., *Tet. Lett.*, **32**, 2265 (1991).



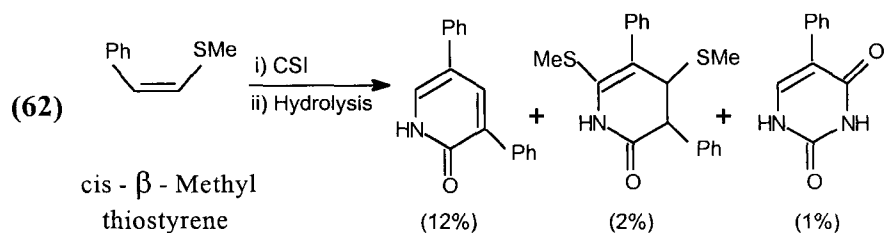
Colvin, E.W., Monteith, M., *JCS Chem. Comm.*, 1230 (1990).



Kametani, T., Honda, T., Nakayama, A., Sasakai, Y., Mochizuki, T., Fukumoto, K., *JCS Perkin Trans.*, I, 2228 (1981).



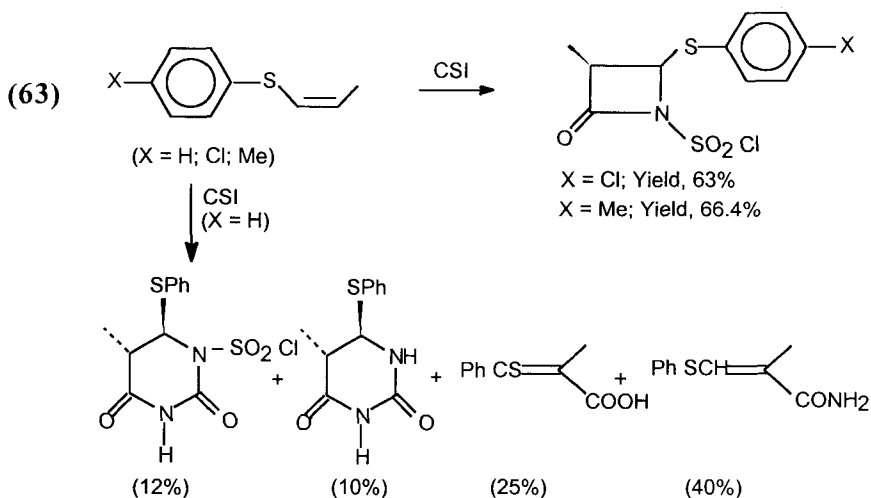
Kametani, T., Honda, T., Nakayama, A., Fukumoto, K., *Heterocycles*, **14**, 1967 (1980).



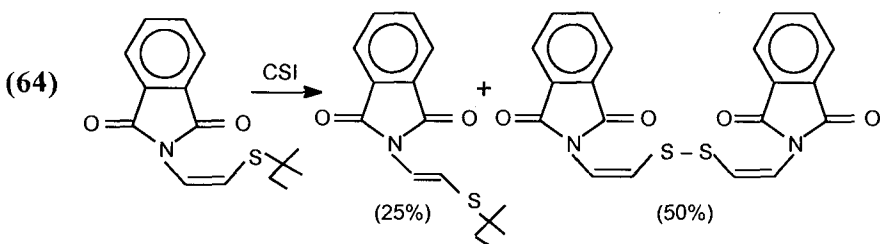
Hirai, K., Matsuda, H., Kishida, Y., *Chem. Pharm. Bull. Jpn.*, **21**, 1090

(1973).

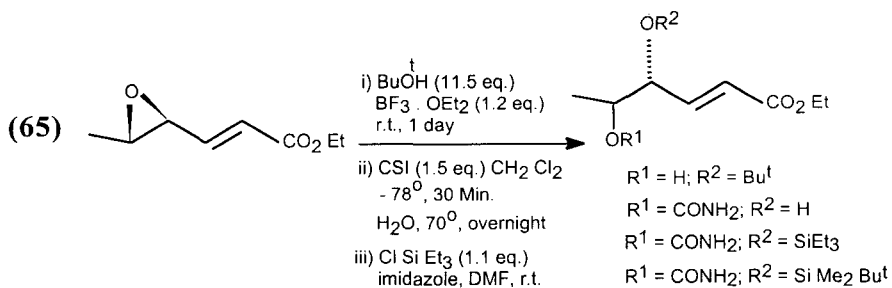
Matsuda, H., Hirai, K., Kishida, Y., *Ann. Sankyo Res. Lab.*, **24**, 96 (1972),
C.A. **79**, 5207P (1973).



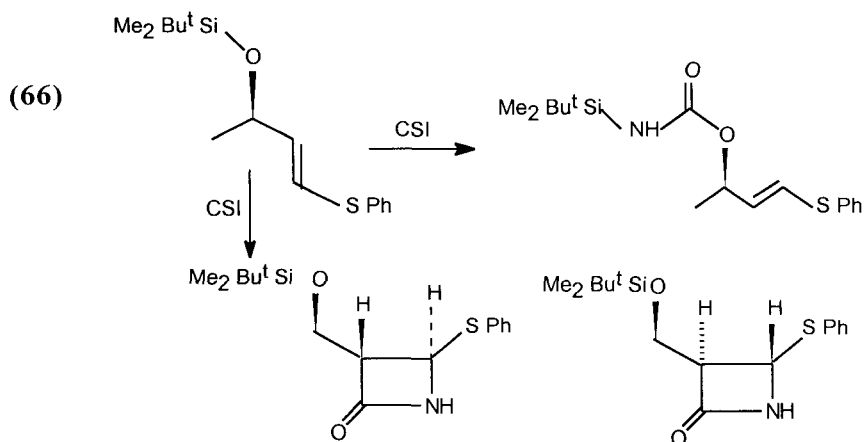
Hirai, I., Matsuda, H., Kishida, Y., *Chem. Pharm. Bull. Jpn.*, **21**, 1090 (1973).



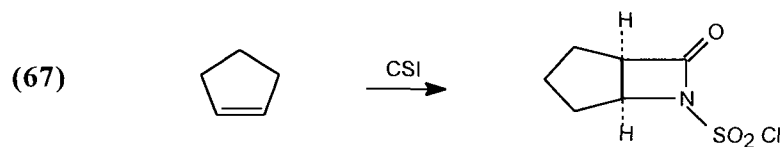
Matsuda, H., Hirai, K., Kishida, Y., *Ann. Sankyo Res. Lab.*, **24**, 96 (1972),
C. A. **79**, 5207P (1973).



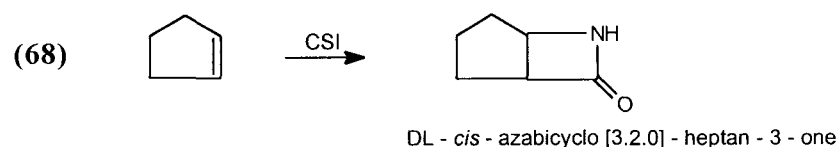
Hirama, M., Shigemoto, T., Yamazaki, Y., Ito, S., *Tet. Lett.*, **26**, 4133 (1985).



Nakatsuka, T., Iwata, H., Tanaka, R., Imajo, S., Ishiguro M., *JCS Chem. Comm.*, 662 (1991).

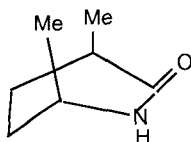
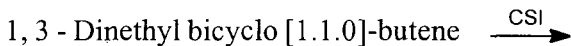
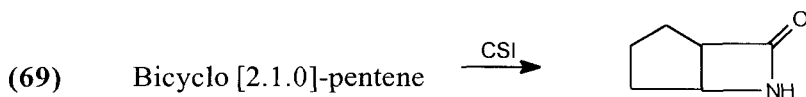


Berge, J.M., Roberts, S.M., Suschitzky, H. Kemp., J.E.G., *J. Chem. Res.*, S, 255 (1978).

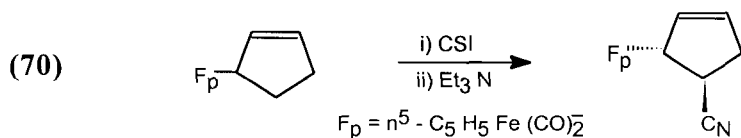


Gomes, A.S., Coutinho, F.B., *J. Polym. Sci. Polym. Lett. Ed.*, **20**, 423

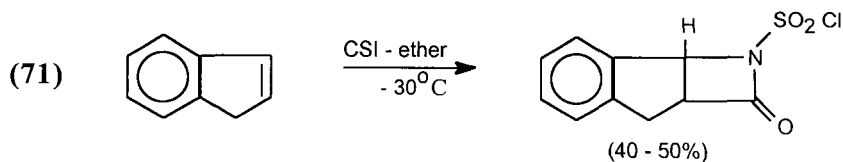
(1982).



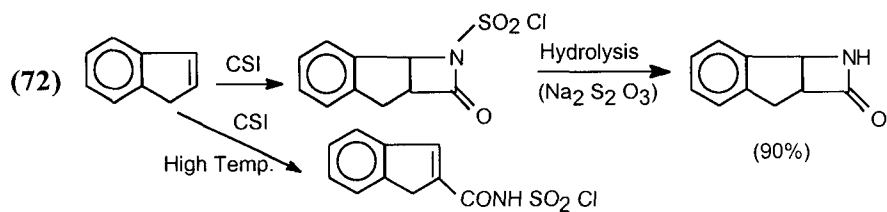
Volz, W.E., Paquette, L.A., Rogido, R.J., Barton, T.J., *Chem., Ind.* (London), 771 (1974).



Giering, W.P., Raghu, S., Rosenblum, M., Cutler, A., Ehntholt, D., Fish, R.W., *JACS*, **94**, 8251 (1972).



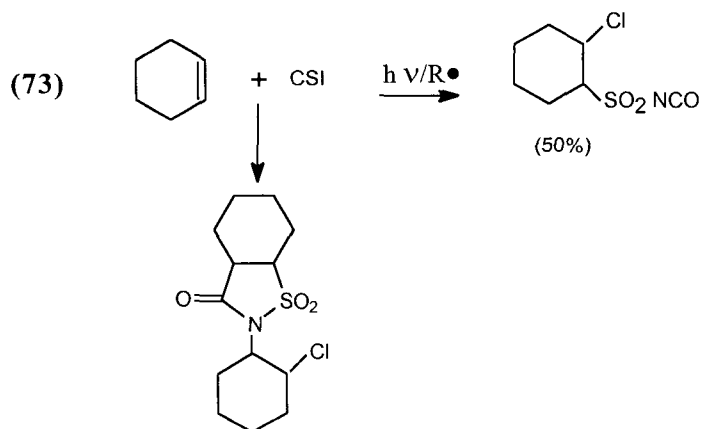
Dunkelblum, E., Shaviv, A., *Isr. J. Chem.*, **10**, 971 (1972).



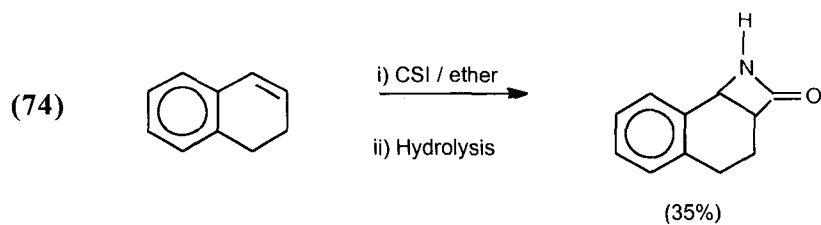
Gomes, A.S., Figueiredo, A.M., *Org. Prep. Int.*, **5**, 13 (1973)

Graf, R., *Ann.*, **661**, 111 (1963).

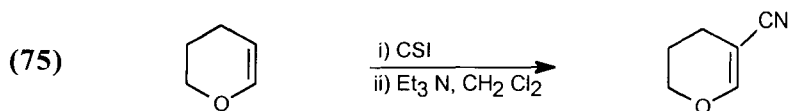
Tabak, D., De Oliveira, P.A.M., *Org. Prep. Proced. Int.*, **8**, 243 (1976).



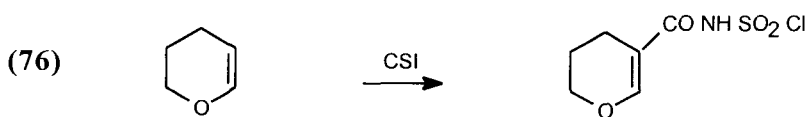
Gunther, D., Soldan, F., *Chem. Ber.*, **103**, 663 (1970).



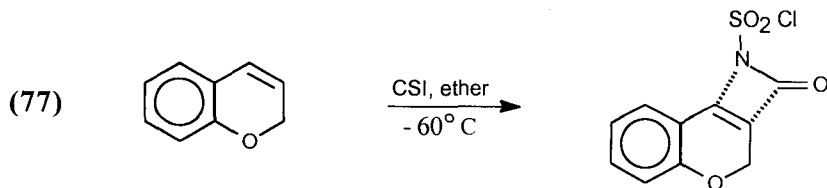
Moriconi, E.J., Mazzocchi, P.H., *JOC*, **31**, 1372 (1966).



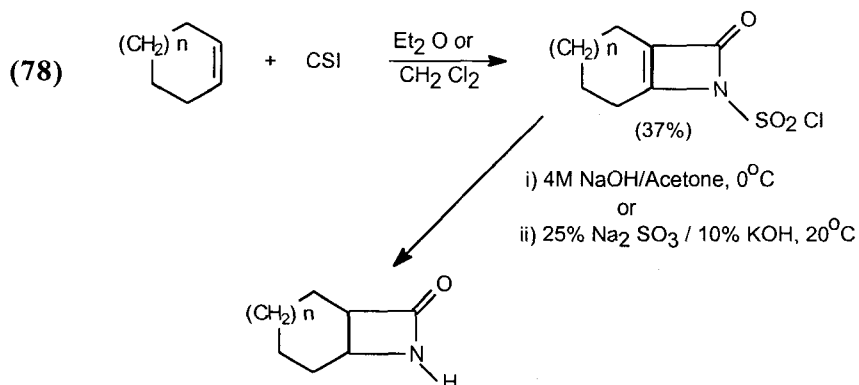
Vorbrüggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



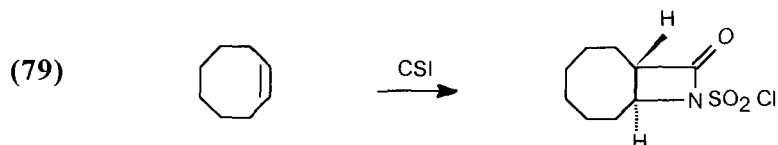
Dhar, D.N., Unpublished results.



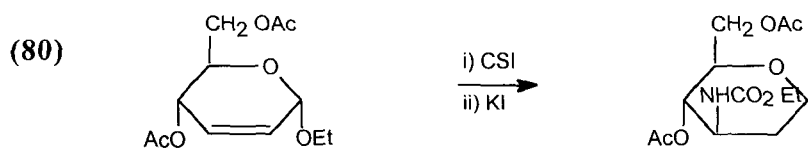
Fliri, A., Hohenlohe - Oehringen, K., *Chem. Ber.*, **113**, 607 (1980).



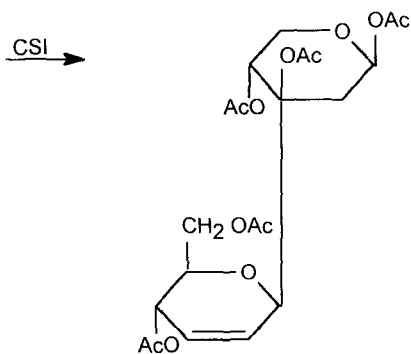
Goodgame, D.M.L., Hill, S.P.W., Lincoln, R., Quiros, M., Williams, D.J., *Polyhedron*, **12**, 2753 (1993).



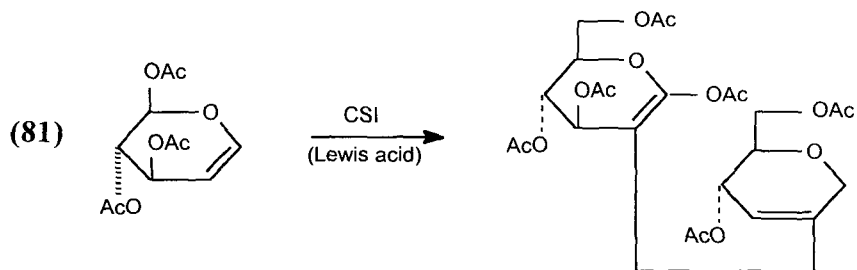
Jandralla, H., Laumen, K., *Chem., Ber.*, **116**, 2136 (1983).

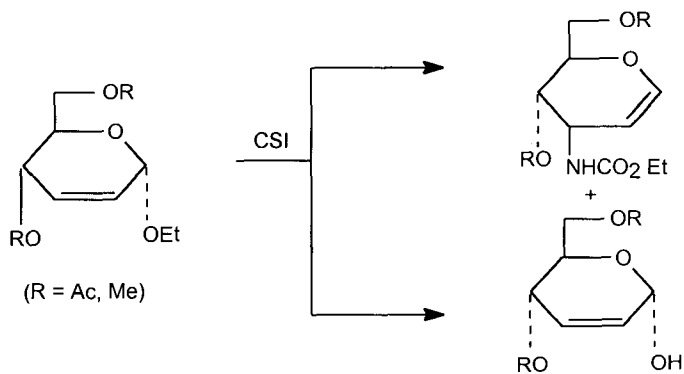


Tri - O - acetyl - D - glucal



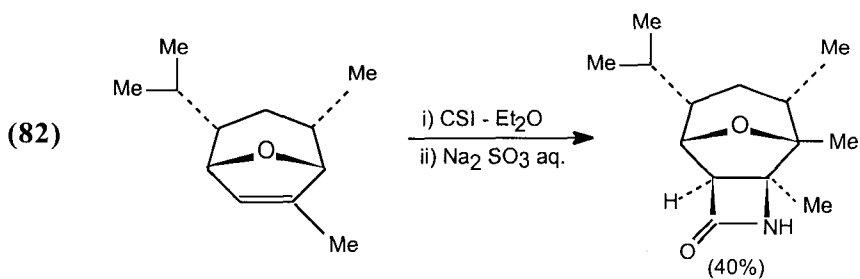
Jordaan, A., Lourens, G.J., *JCS. D. II*, 581 (1971).



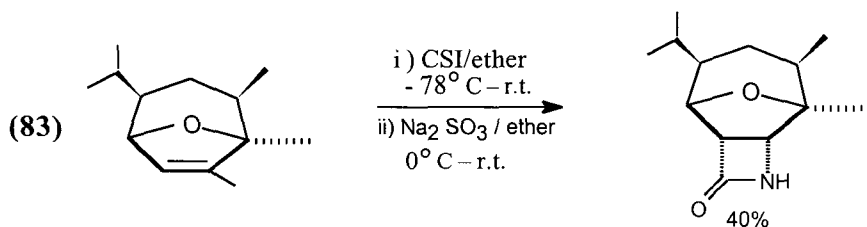


Hall, R.H., Jordaan, A., Lourens, G.J., *JCS Perkin Trans. I*, 38 (1973).

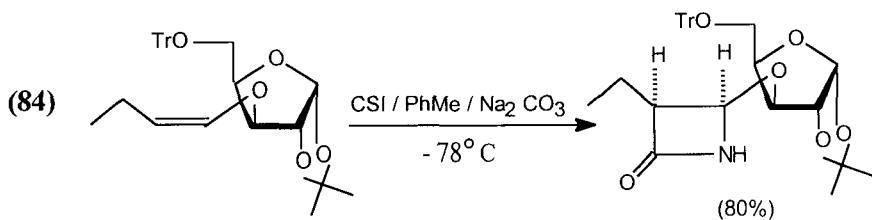
Hall, R.H., Jordaan, A., DeVilliers, O.G., *JCS Perkin Trans. I*, 626 (1975).



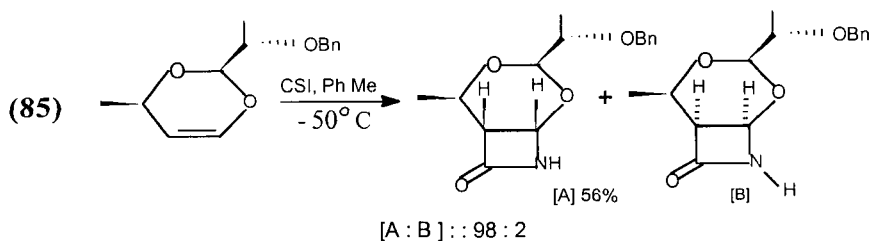
Drew, M.G.B., Mann, J., Holland, H.J., Lewis, T., *J. Chem. Res. Synop.*, 389 (1987).



Mann, J., Overton, H.J., *Tet. Lett.*, **26**, 6133 (1985).

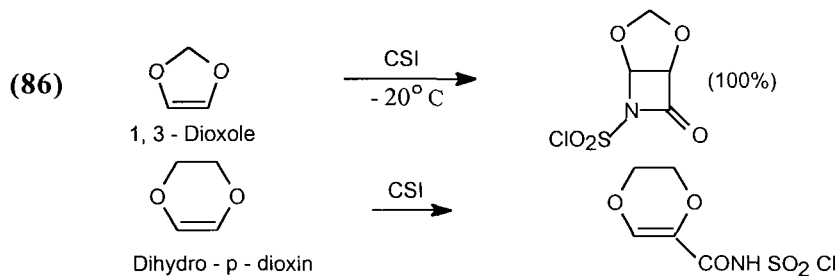


Furman, B., Kaluza, Z., Chmielewski, M., *Tetrahedron*, **52**, 6109 (1996).

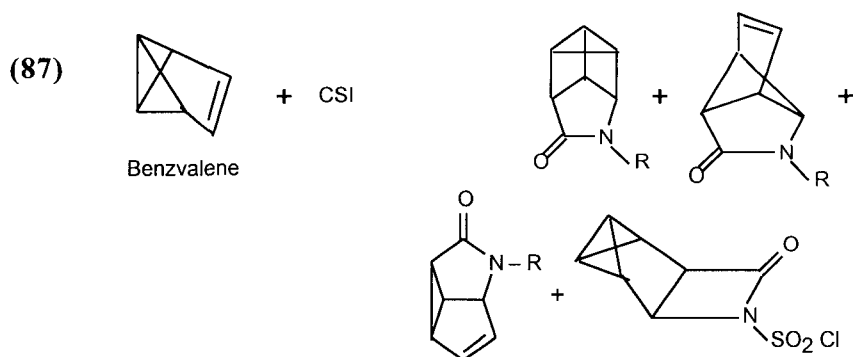


Ito, Y., Kobayashi, Y; Terashima, S., *Tet. Lett.*, **30**, 5631 (1989).

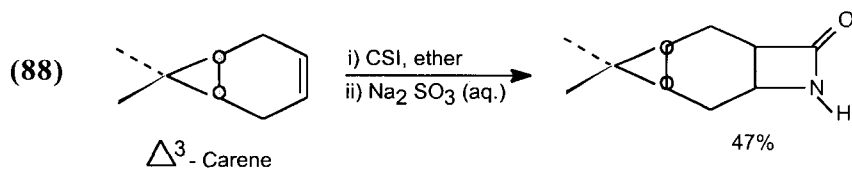
Kobayashi, Y., Ito, Y., Terashima, S., *Tetrahedron*, **48**, 55 (1992).



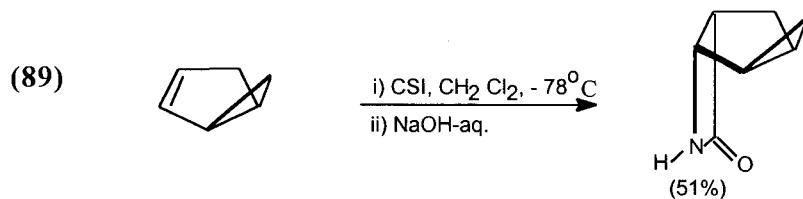
Lattrell, R., *Ann.*, **722**, 132 (1969).



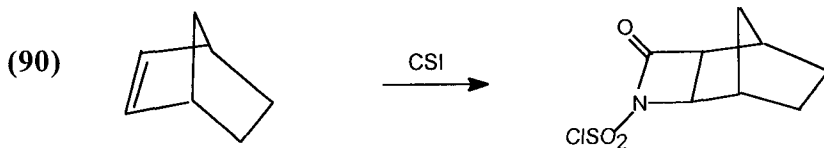
Christl, M., Brunn, E., Lanzendörfer, F., *JACS*, **106**, 373 (1984).



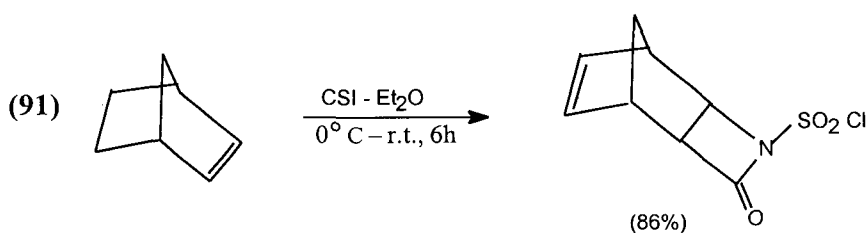
Sasaki, T., Eguchi, S., Yamada, H., *JOC*, **38**, 679 (1973).



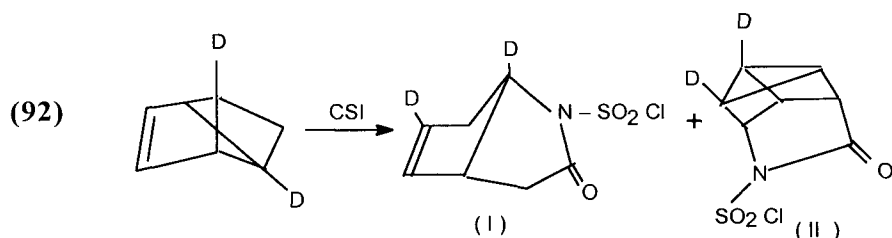
Paquette, L.A., Allen (Jr.), G.R., Broadhurst, M.J., *JACS*, **93**, 4503 (1971).



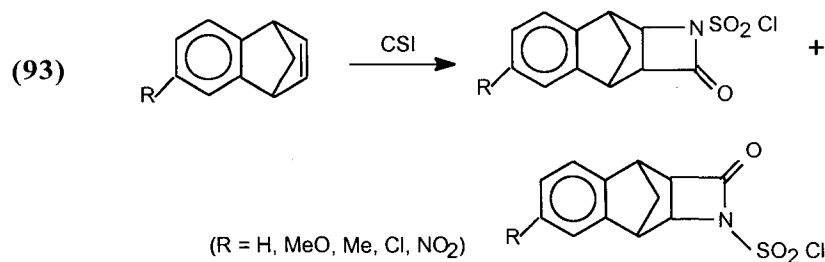
Moriconi, E.J., Mazzocchi, P.H., *JOC*, **31**, 1372 (1966).



Moriconi, E.J., Crawford, W.C., *JOC*, **33**, 370 (1968).

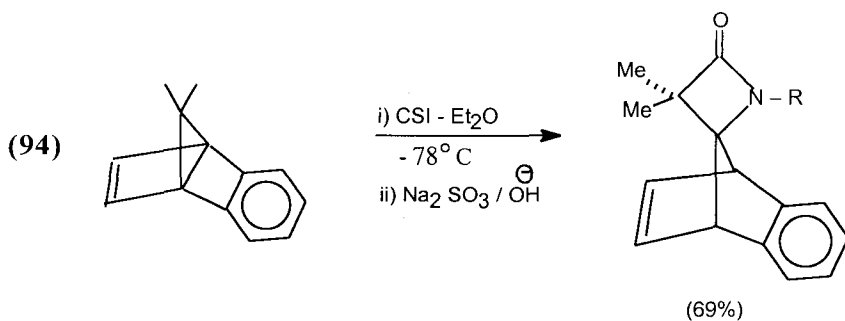


Katz, T.J., Nicolaou, K.C., *JACS*, **96**, 1948 (1974).

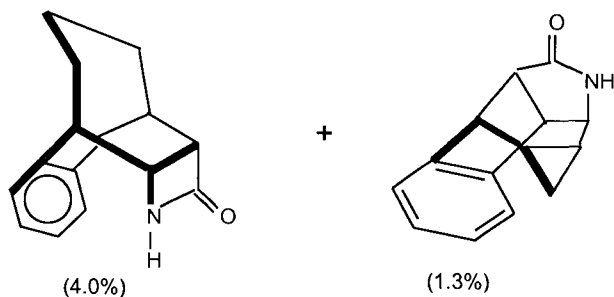
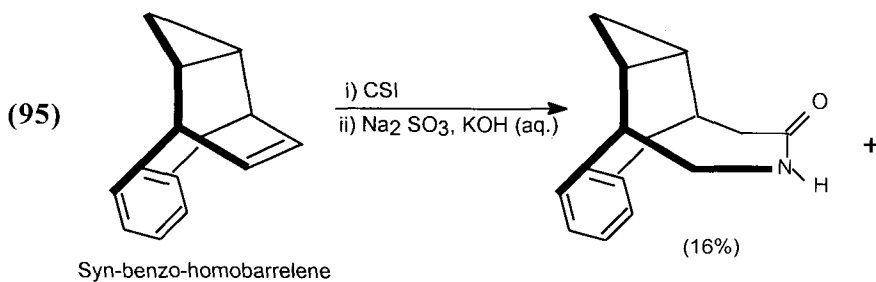


Mazzocchi, P.H., Harrison, A.M., *Isr. J. Chem.*, **21**, 164 (1981).

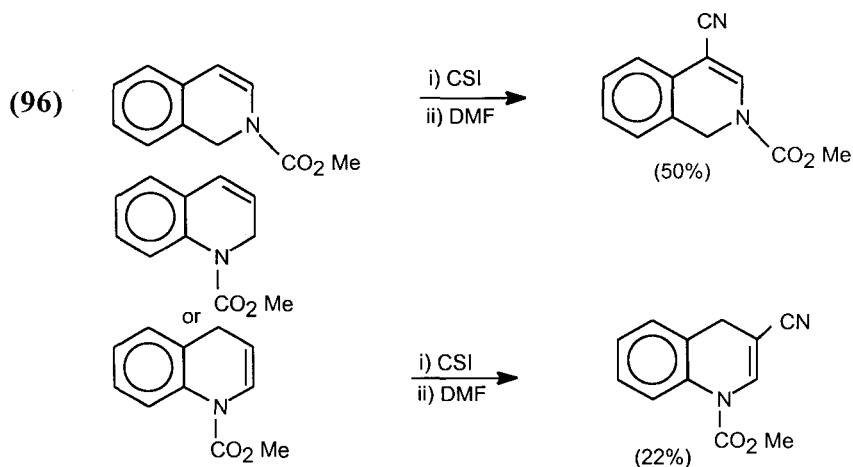
Harrison, A.M., *Dissertation Abstr. Int. B.*, **42**, 4423 (1982).



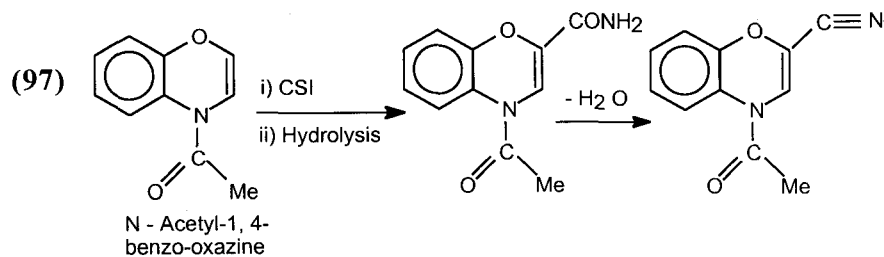
Sasaki, T., Hayakawa, K., Manabe, T., Nishida, S., *JACS*, **103**, 565 (1981).



Volz, W.E., Paquette, L.A., *JOC*, **41**, 57 (1976).

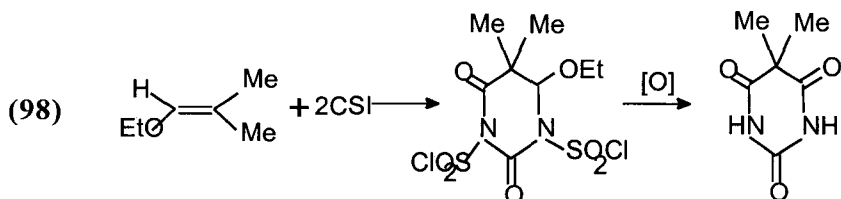


Natsumi, M., Kumadaki, S., Kanda, Y, Kiuchi, K., *Tet. Lett.*, **14**, 2335 (1973).



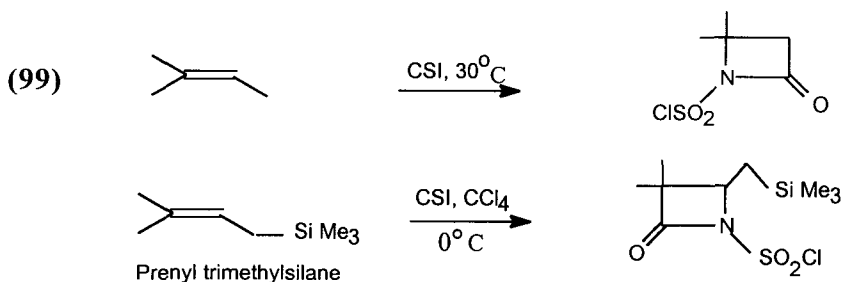
Bartisch, H., Schwarz, O., *Arch. Pharm.*, **315**, 545 (1982).

Tri-Substituted Alkenes

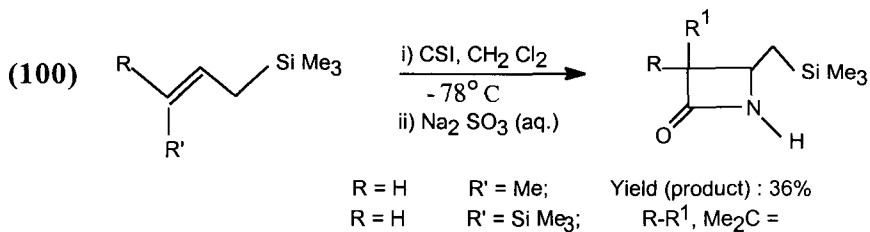


Matterstock, K., (Farbwerke Hoechst, A.G.), unpublished results.

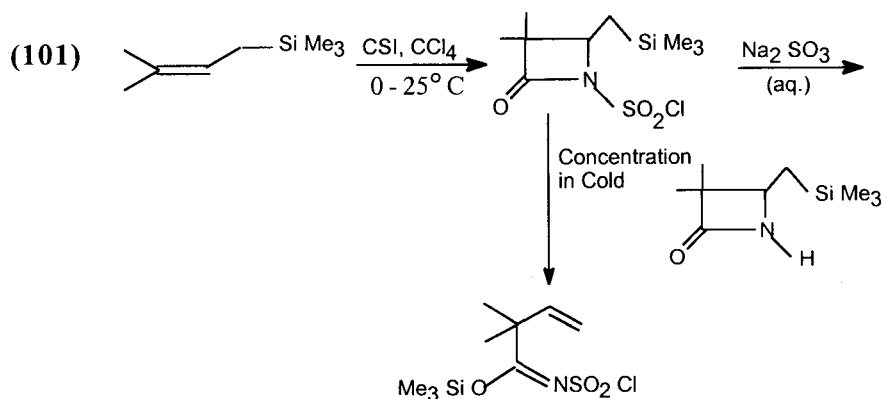
Graf. R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).



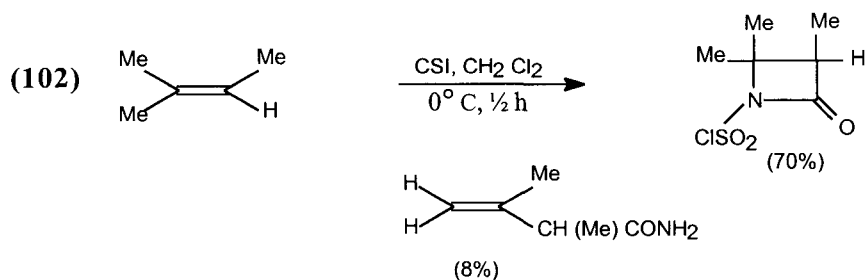
Deleris, G., Pillot, J.P., Rayez, J.C., *Tetrahedron*, **36**, 2215 (1980).



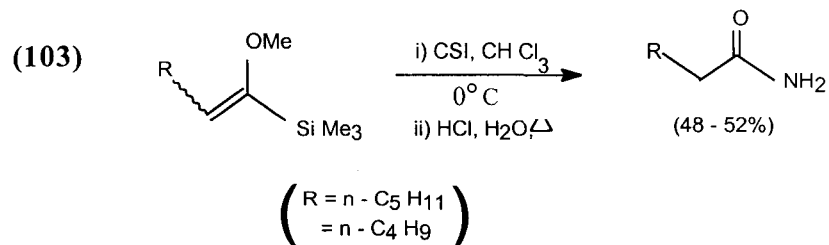
Nativi, C., Perrota, E., Ricci, A., Taddei, M., *Tet. Lett.*, **32**, 2265 (1991).



Colvin, E.W., Monteith, M., *JCS Chem. Comm.*, 1230 (1990).



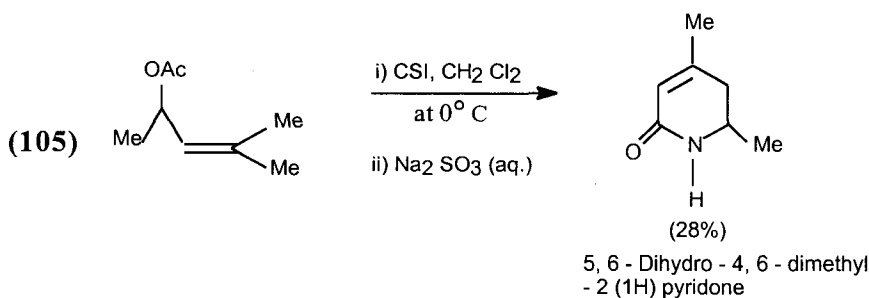
Moriconi, E.J., Kelly, J.F. and Salomone, R.A., *JOC*, **33**, 3448 (1968).



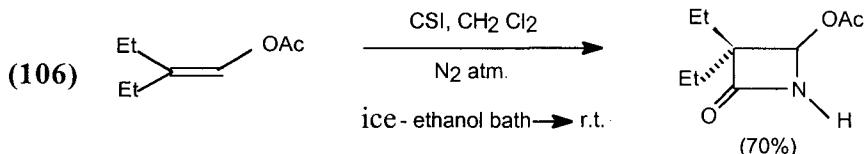
Page, P.C.B., Rosenthal, S., Williams, R.V., *Synthesis*, 621 (1988).



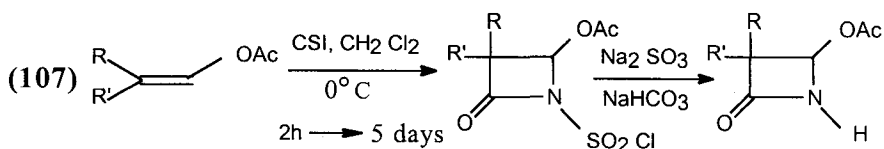
Imanieh, H., MacLeod, D., Quayle, P., Peter, D., Gareth, M., *Tet. Lett.*, **30**, 2689 (1989).



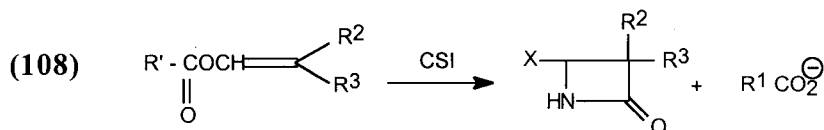
Bateson, J.H., Quinn, A.M., Smale, T.C., Southgate, R., *JCS Perkin Trans. I*, 2219 (1985).



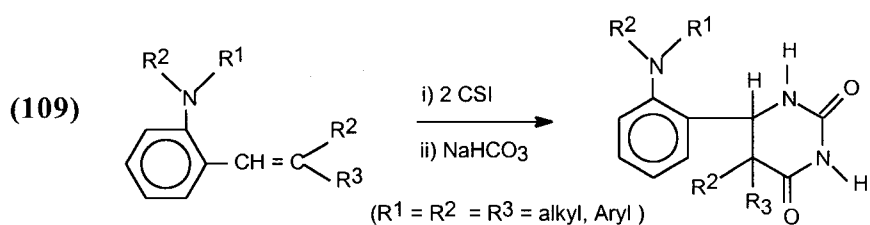
Shah, S.K., Dorn (Jr.) C.P., Finke, P.E., Hale, J.J., Haggmann, W.K., Brause, K.A., Chandler, G.O., Kissinger, A.L., Ashe, B.M., Weston, H., Knight, W.B., Maycock, A.L., Dellea, P.S., Fletcher, B.S., Hard, K.M., Mumford, R.A., Underwood, D.J., Doherty, J.B., *J. Med. Chem.*, **35**, 3745 (1992).



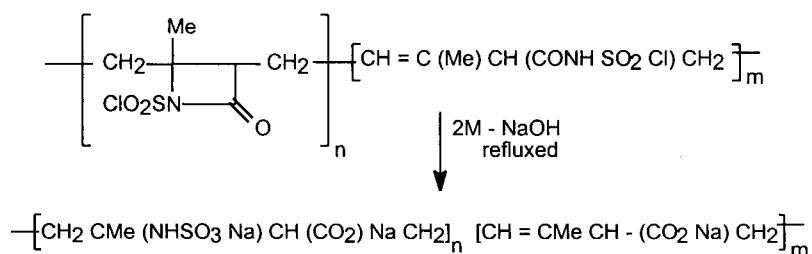
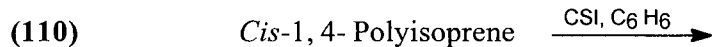
Firestone, R.A., Barker, P.L., Pisano, J.M., Ashe, B.M., Dahlgren, M.E., *Tetrahedron*, **46**, 2255 (1990).



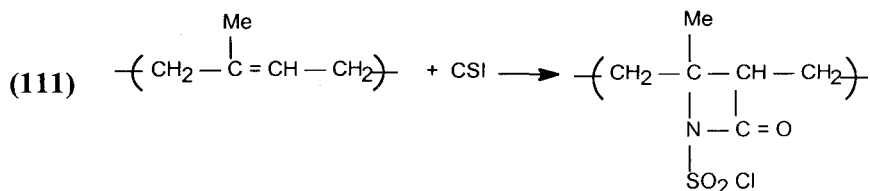
Clauss, K., Grimm, D., Prossel, G., *Ann.*, 539 (1974).



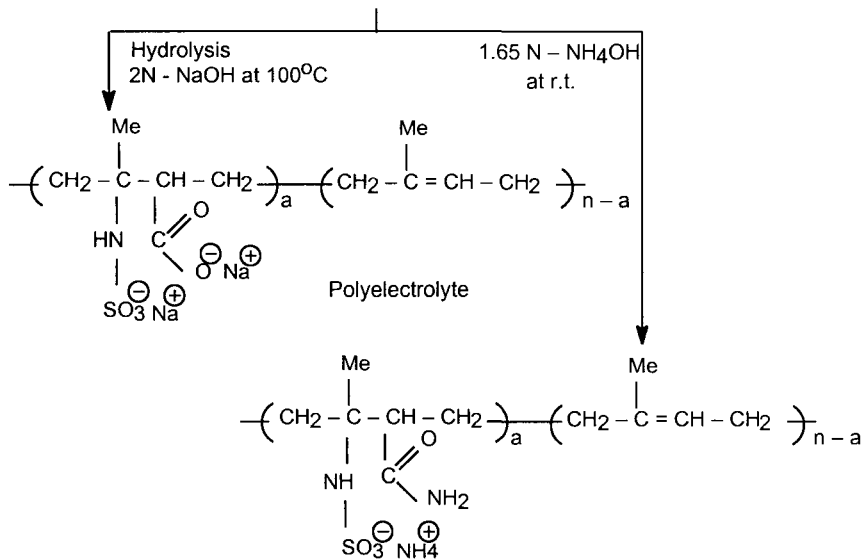
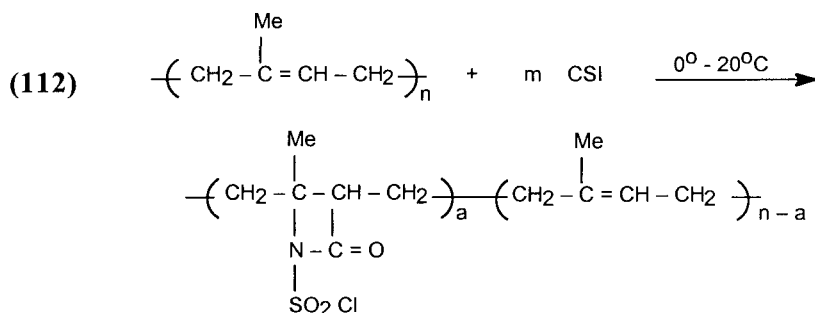
Hollywood, F., Suschitzky, H., Hull, R., *Synthesis*, 662 (1982).



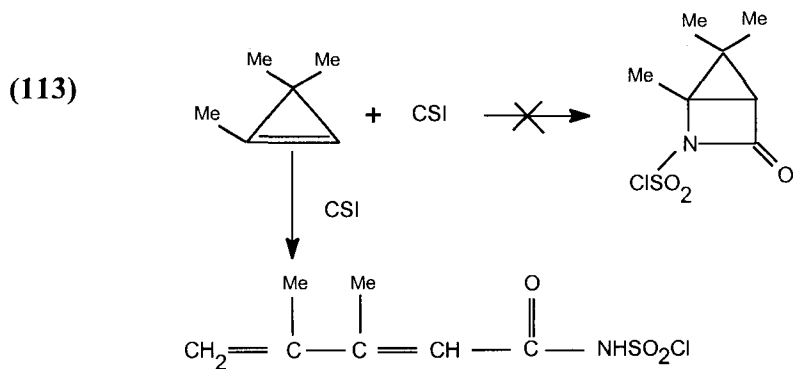
Van der Does, L., Hofman, J., Van Utteren, T.E.C., *J. Polym. Sci. Polym. Lett. Ed.*, 11, 169 (1973).



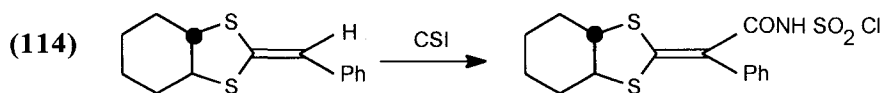
Van der Velden, P.M., Smolders, C.A., *J. Appl. Polymer. Sci.*, **20**, 1153 (1976).



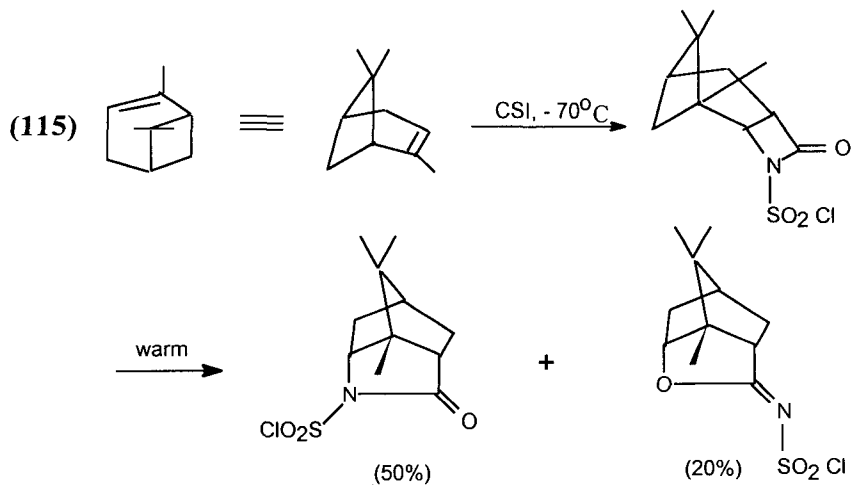
Van der Velden, P.M., Smolders, C.A., *J. Appl. Polym. Sci.*, **21**, 1445 (1977).



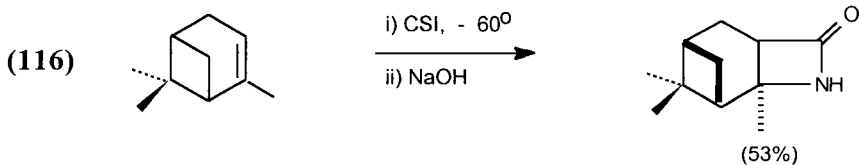
Barton, T.J., Rogido, R., Clardy, J.C., *Tet. Lett.*, **11**, 2081 (1970).



Carey, F.A. and Neergaard, J.R., *JOC*, **36**, 2731 (1971).



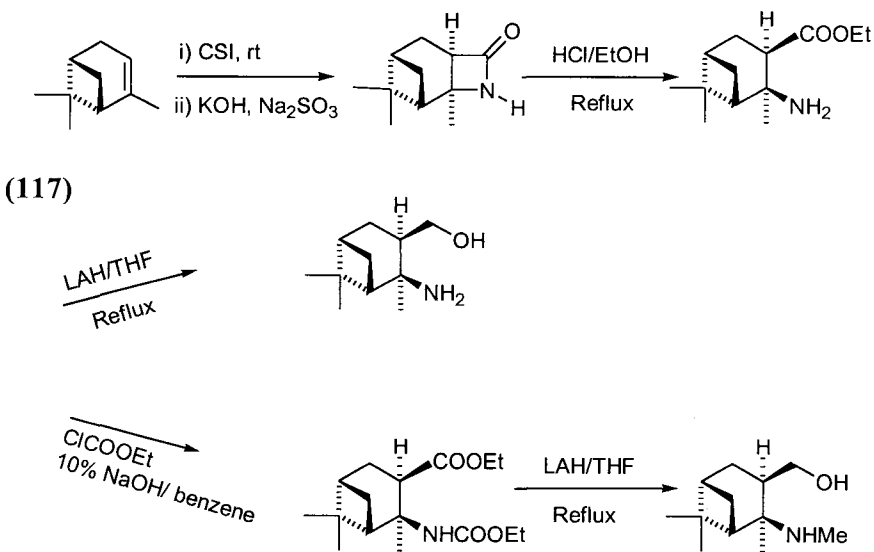
Malpass, J.R., *Tet. Lett.*, **13**, 4951 (1972).



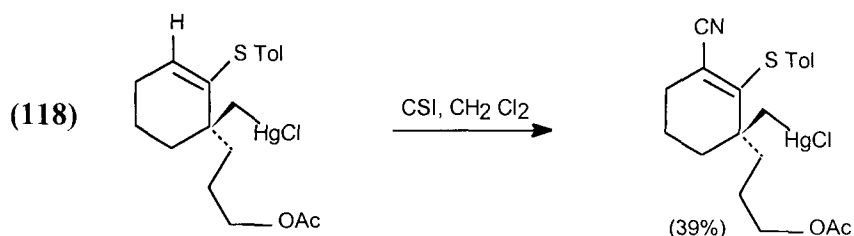
Furst, G.T., Wachsman, M.A., Pieroni, J., White, J.G., Moriconi, E.J., *Tetrahedron*, **29**, 1675 (1973).

Sasaki, T., Eguchi, S., Yamada, H., *JOC*, **38**, 679 (1973).

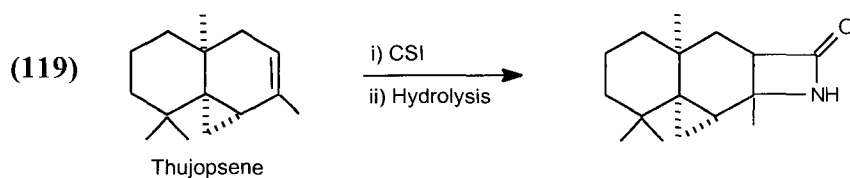
Malpass, J.R., *Tet. Lett.*, **13**, 4951 (1972).



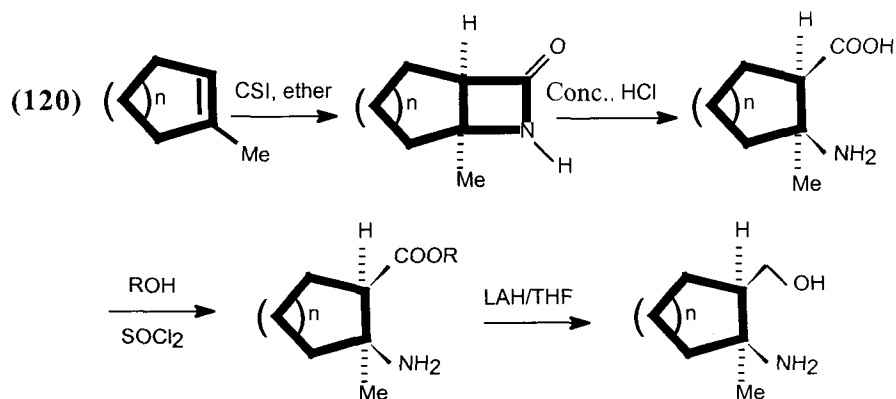
Szakonyi, Z., Martinek, T., Hetenyi, A., Fulop, F., *Tet. Asymm.*, **11**, 4571 (2000).



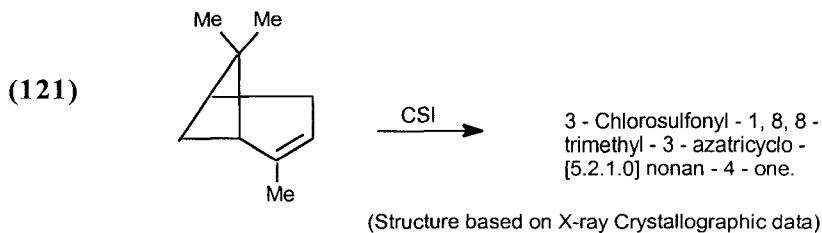
Takemoto, Y., Ohra, T., Yonetoku, Y., Imanishi, T., Iwata, C., *JCS Chem. Comm.*, 192 (1992).



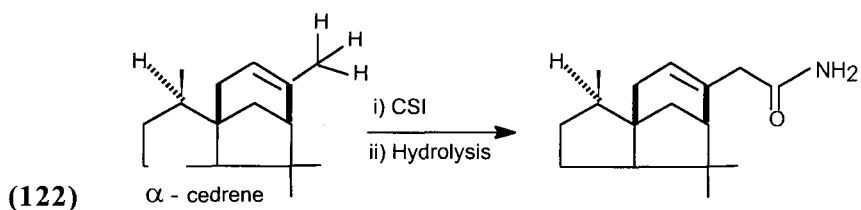
Mehta, G., Dhar, D.N., Suri, S.C., *Ind. J. Chem.*, **16B**, 87 (1978).



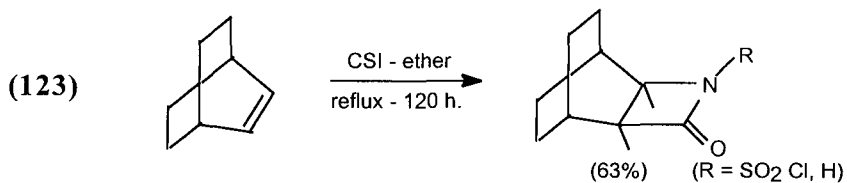
Szakonyi, Z., Fülöp, F., Bernáth, G., Evanics, F., Riddell, F.G., *Tetrahedron*, **54**, 1013 (1998).



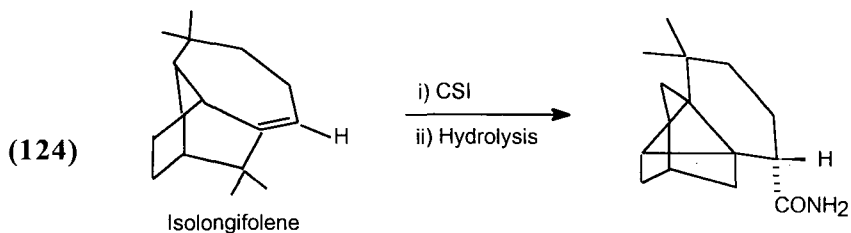
Waschman, M.A., Crowley, J., White, J.G., *Z. Kristallogr.*, **156**, 137 (1981).



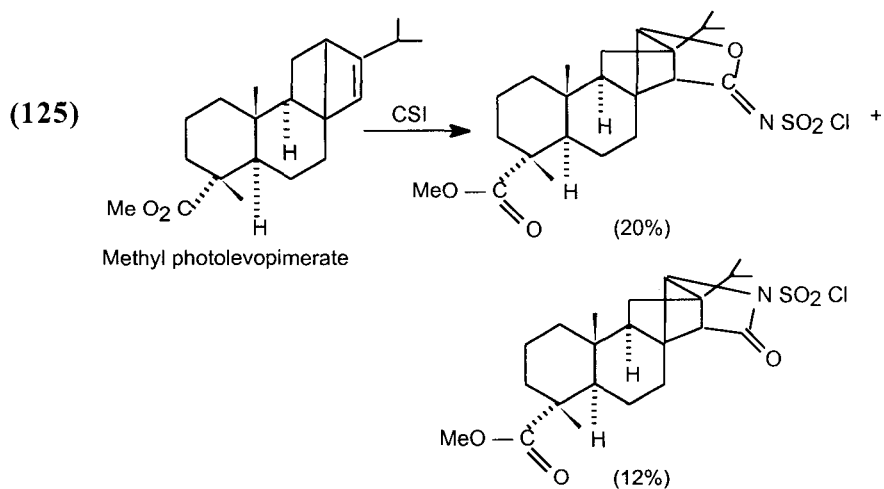
Mehta, G., Dhar, D.N., Suri, S.C., *Ind. J. Chem.*, **16B**, 87 (1978).



Moriconi, E.J., Crawford, W.C., *JOC*, **33**, 370 (1968).

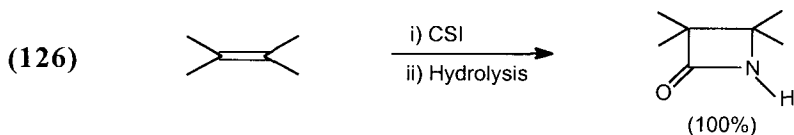


Mehta, G., Dhar, D.N., Suri, S.C., *Ind. J. Chem.*, **16B**, 87 (1978).

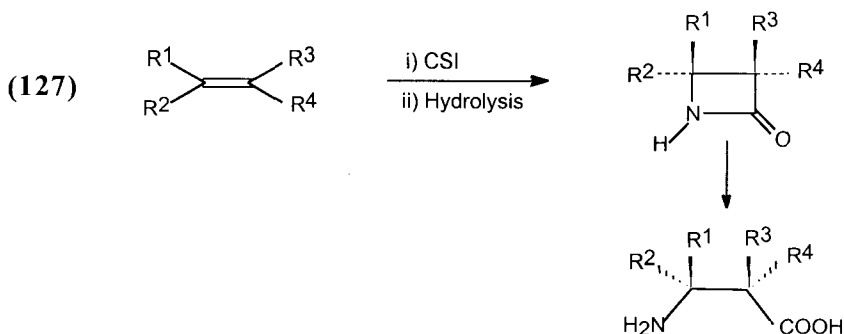


Mehta, G., Dhar, D.N., Suri, S.C., Bhadbhade, M.M., Venkatesan, K., *Ind. J. Chem.*, **20B**, 193 (1981).

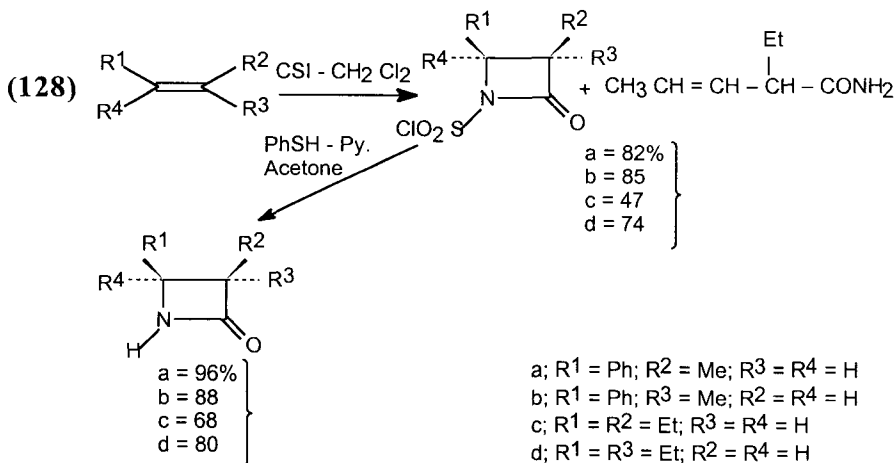
Tetra-Substituted Alkenes



R. Graf. *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968); Cossio, F., Roa, G., Lecea, B., Ugalde, J.M., *JACS*, **117**, 12306 (1995).



Meyers, A.I., "*Heterocycles in Organic Synthesis*" John Wiley & Sons, Inc., New York, NY., pp. 285-286 (1974).

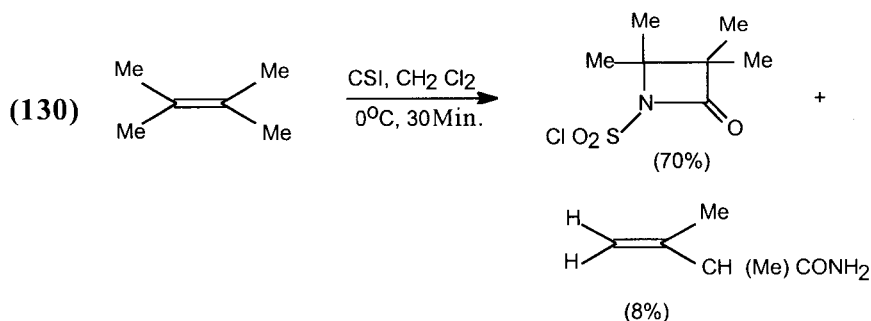


Moriconi, E.J., Kelly, J.F., *Tet. Lett.*, **9**, 1435 (1968).

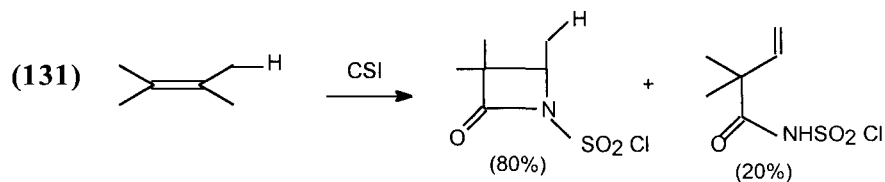
JOC, **33**, 3036 (1968).



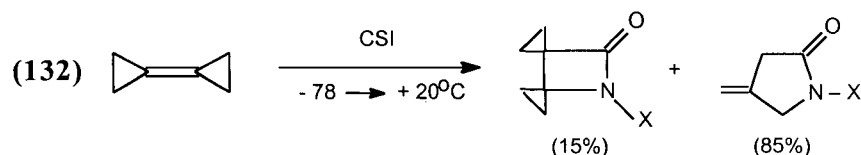
[M] = $n^5 C_5 H_5 Fe (CO)_2^-$; $n^5 - C_5 H_5 Mo (CO)_3$; $Mn(CO)_5^-$ -
 Yamamoto, Y., Wojcicki, A; *Inorg. Nucl. Chem. Lett.*, **8**, 833 (1972); *JCS Chem. Comm.*, 1088 (1972); *Inorganic Chem.*, 1779 (1973).



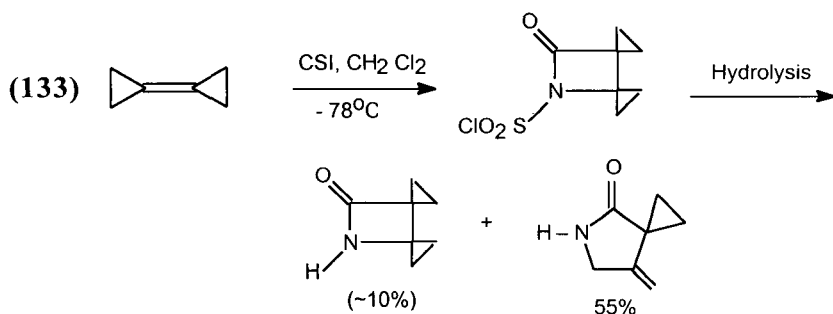
Moriconi, E.J., Kelly, J.F., Salomone, R.A., *JOC*, **33**, 3448 (1968).



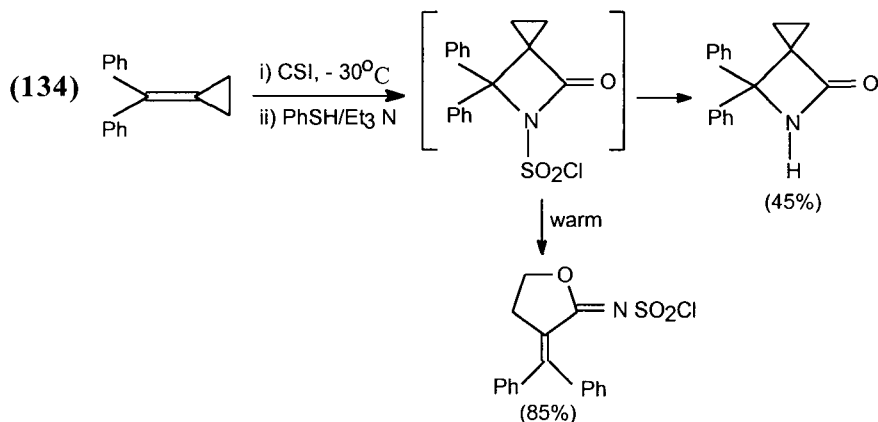
Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).



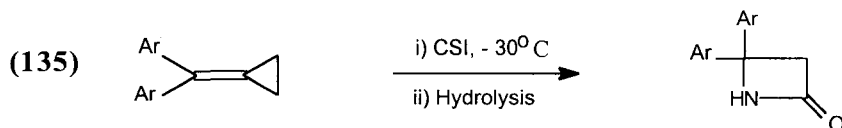
Weber, W., Erden, I., de Meijere, A., *Angew. Chem.*, **19**, 387 (1980).



de Meijere, A., Erden, I., Weber, W., Kaufmann, *JOC*, **53**, 152 (1988).



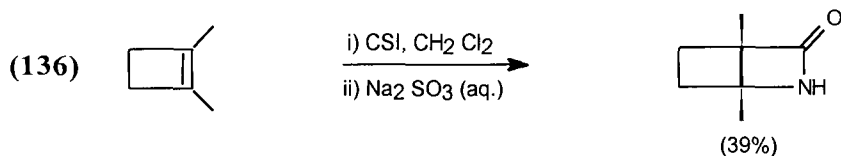
Barton, T.J., Rogido, R.J., *Tet. Lett.*, **13**, 3901 (1972); Dunkelblum, E., *Tet. Lett.*, **13**, 1551 (1972).



Clauss, K., *Tet. Lett.*, **15**, 1271 (1974).

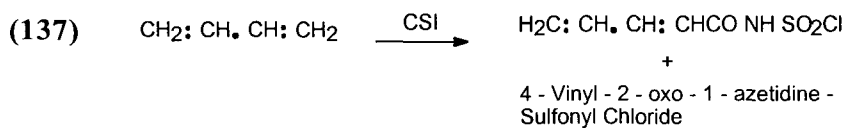
Barton, T.J., Rogido, E.J., *Tet. Lett.*, **13**, 878 (1972).

Aue, D.H., Iwahashi, H., Shellhamer, D.F., *Tet. Lett.*, **14**, 3719 (1973).

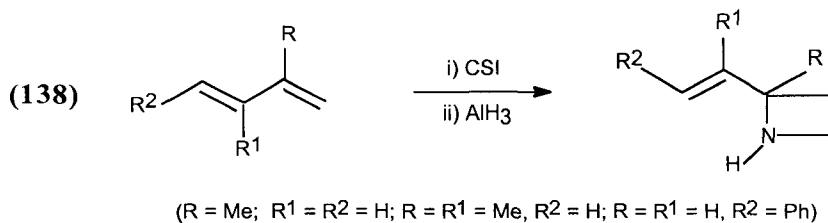


Aue, D.H., Iwahashi, H., Shellhamer, D.F., *Tet. Lett.*, **14**, 3719 (1973).

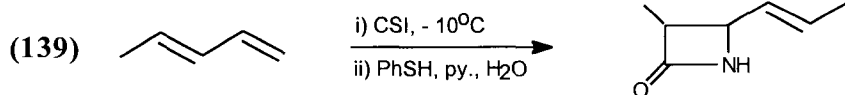
Conjugated Dienes



Goebel, P., Clauss, K. *Ann.*, **722**, 122 (1969).

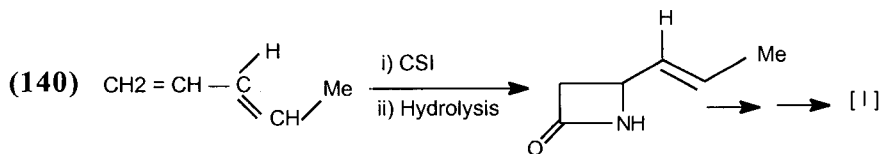


Hassner, A., Wiegand, N., *JOC*, **51**, 3652 (1986).



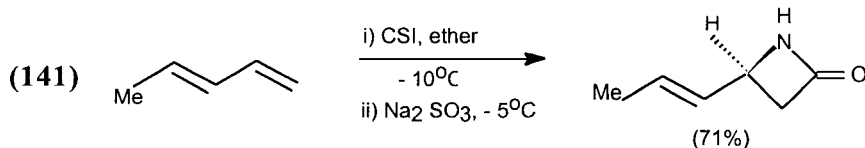
Moriconi, E.J., Meyer, W.C., *JOC*, **36**, 284 (1971).

Baxter, A.J.G., Dickinson, K.H. *JCS Chem. Comm.*, 236 (1979).

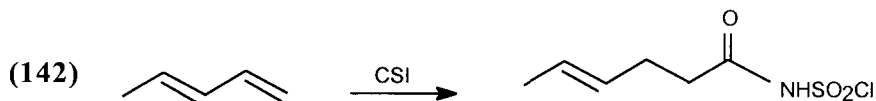


[1] = 7-oxo-1-aza-bicyclo[3.2.0]hept-2-ene-2-carboxylate system (olivanic acid)

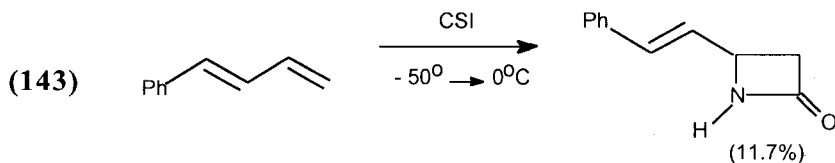
Bateson, J.H., Baxter, A.J.G., Roberts, P.M., Smale, T.C., Southgate, R., *JCS Perkin Trans. I*, **96**, 142521 (1982).



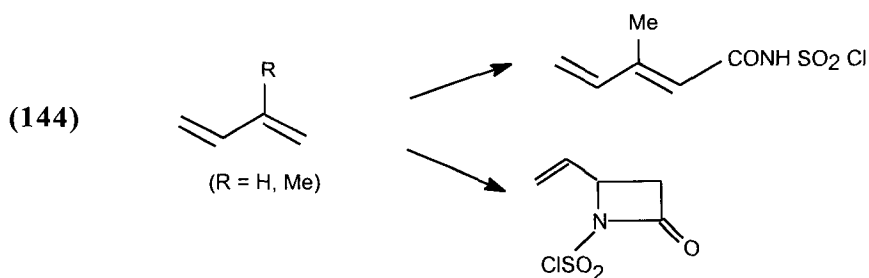
Hausser, F.M., Rhee, R.P., Ellenberger, S.R., *JOC*, **49**, 2236 (1984).



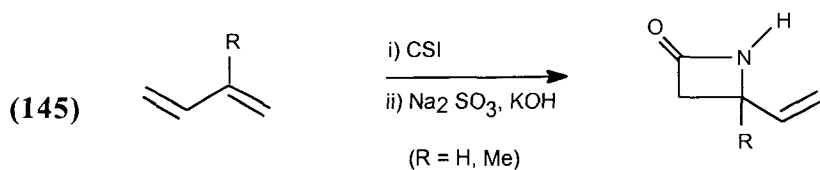
Hoffmann, H., Diehr, H.J., *Tet. Lett.*, **3**, 1875 (1963).



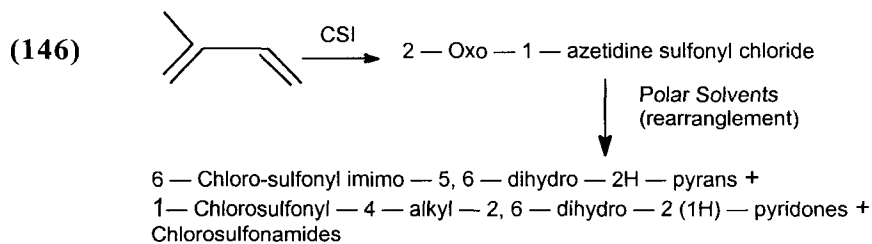
Hassner, A., Wiegard, N., *JOC*, **51**, 3652 (1986).



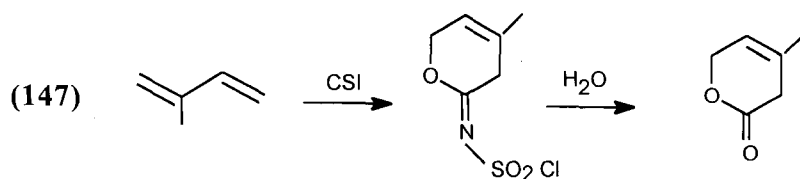
Moriconi, E.J., Meyer, W.C., *Tet. Lett.*, **9**, 3823 (1968).



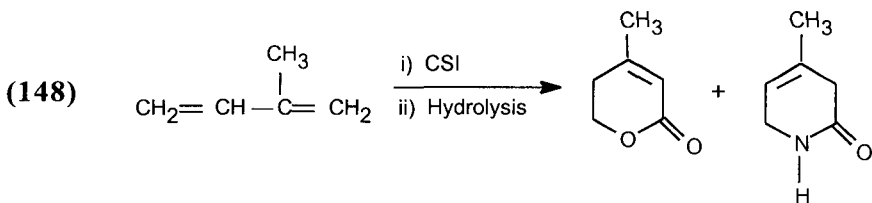
Deprès, J-P., Greene, A.E., Crabbé, P., *Tet. Lett.*, **19**, 2191 (1978).



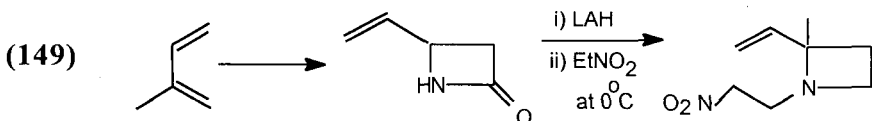
Goebel, P., Clauss, K., *Ann.*, **722**, 122 (1969).



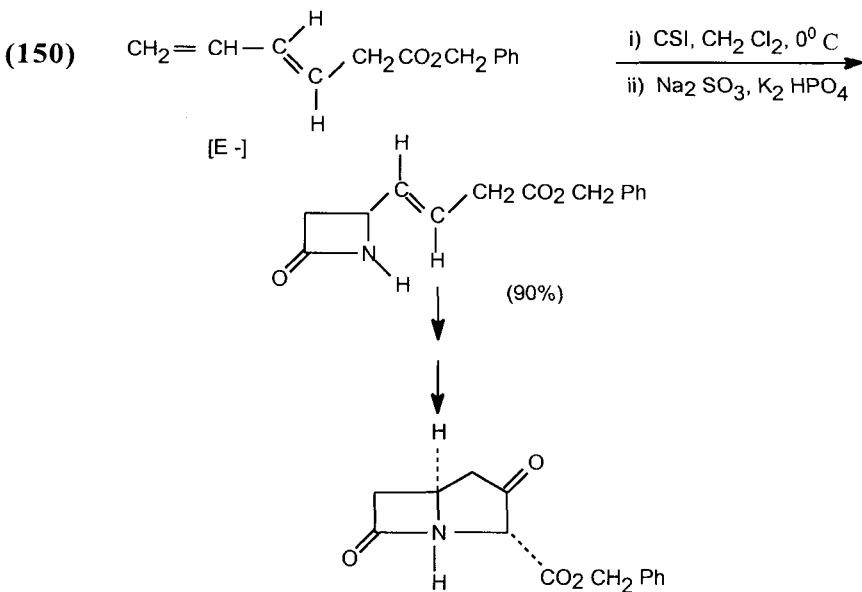
Clauss, K., Tweddle, N.J., *Ann.*, **722**, 142 (1969).



Haug, T., Lohse, F., Metzger, K., Batzer, H., *Helv. Chim. Acta*, **15**, 2069 (1968).

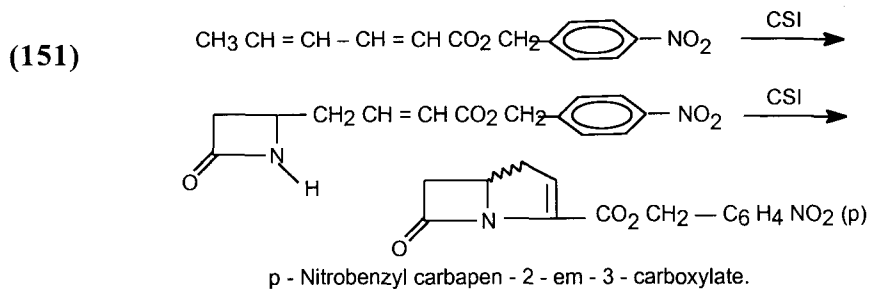


Hassner, A., Keshava Murthy, K.S., *Tet. Lett.*, **28**, 4097 (1987).

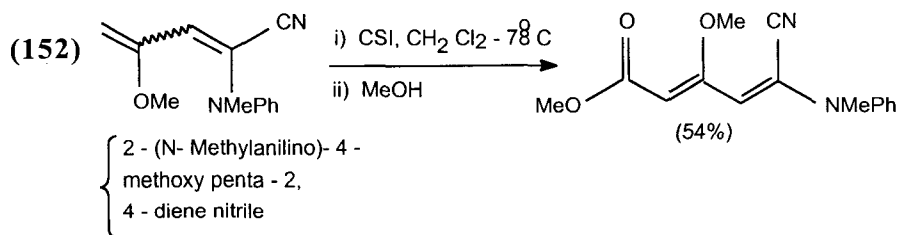


Benzyl-3,7-dioxo-1-azabicyclo[3.2.0]-heptane-2-carboxylate.

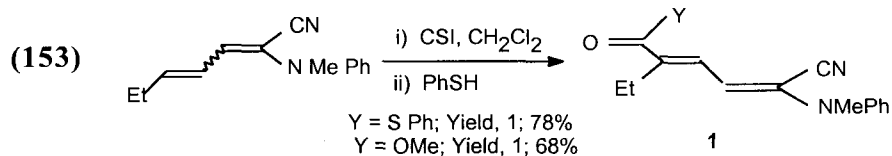
Berges, D.A., Snipes, E.R., Chan, G.W., Kingsbury, W.D., Kinzig, C.M., *Tet. Lett.*, **22**, 3557 (1981).



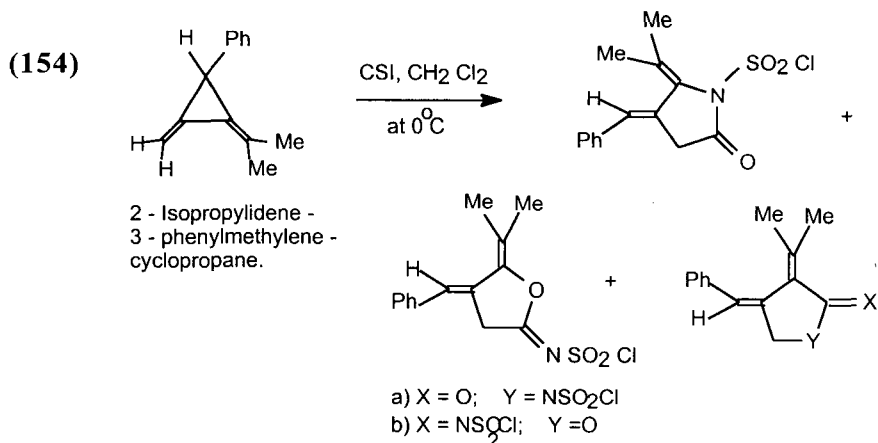
Uedo, Y., Damas, C.E., Vinet, V., *Can. J. Chem.*, **61**, 2257 (1983).



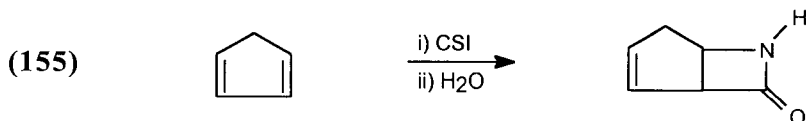
Wang, Y.W., Fang, J.M., Wang, Y.K., Wang, M.H., Ko, T.Y., Cherng, Y.J., *JCS Perkin Trans. I*, 1209 (1992).



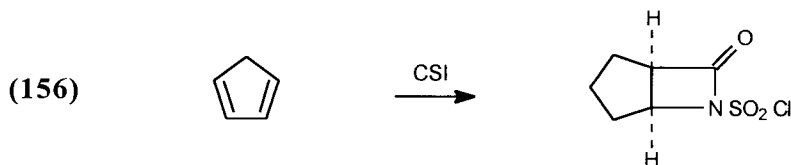
Fang, J-M, Yang, C-C, Wang, Y.W., *JOC*, **54**, 477 (1989).



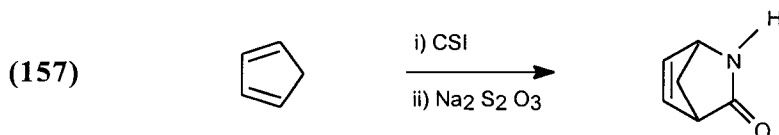
Pasto, D.J., Smorada, R.L., Turini, B.L., Wampfler, D.J., *JOC*, **41**, 432 (1976).



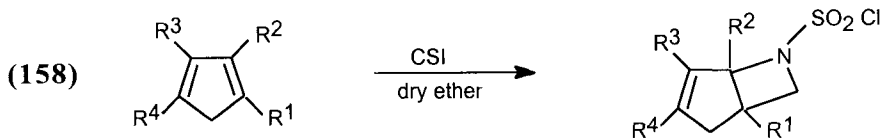
Hauser, F.M., Rhee, R.P., *JOC*, **46**, 227 (1981).



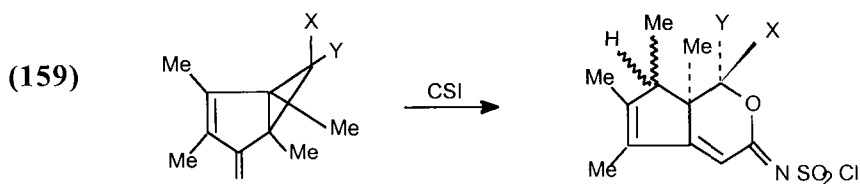
Berge, J.M., Roberts, S.M., Suschitzky, H., Kemp, J.E.G., *J. Chem. Res. (S)*, 255 (1978).



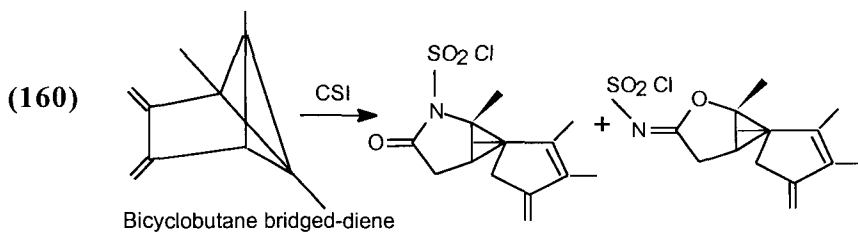
Archelas, A., Morin, C., *Tet. Lett.*, **25**, 1277 (1984).



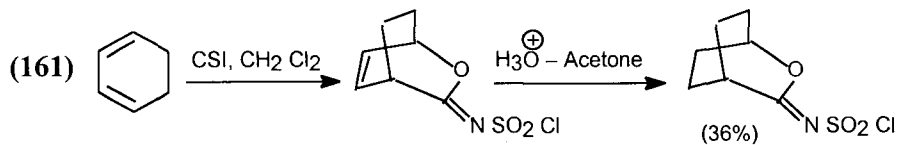
Narasimhan, K., Kumar, P.R., *Heterocycles*, **22**, 2751 (1984).



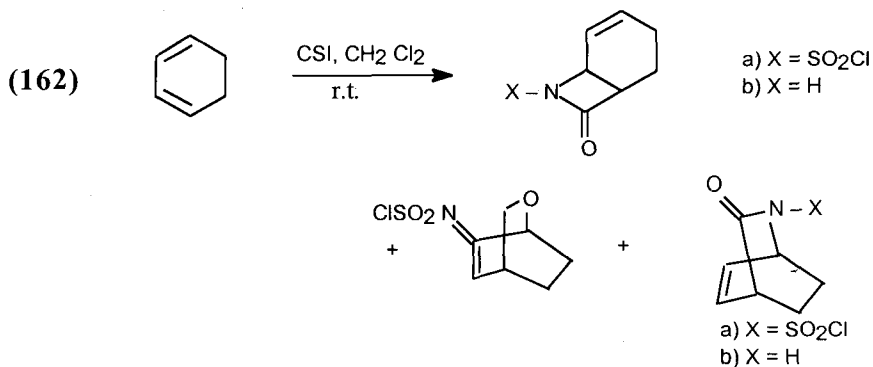
Askani, R., *Angew. Chem. Int. Ed. Engl.*, **9**, 167 (1970).



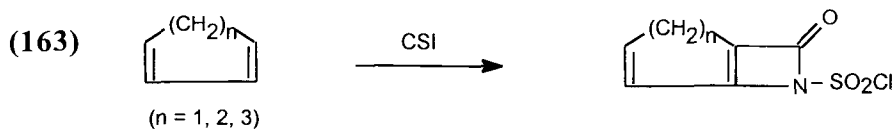
Hogeveen, H., Zwart, L., *JOC*, **44**, 1365 (1979).



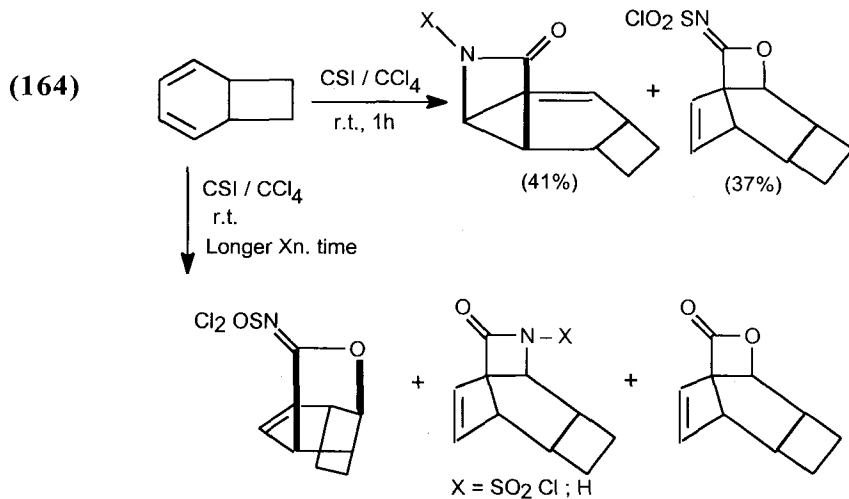
Konkel, M.J., Vince, R., *Tetrahedron*, **52**, 799 (1996).



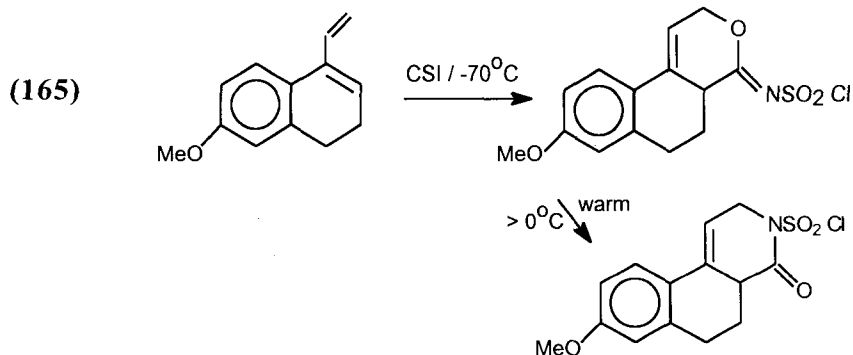
Malpass, J.R., Tweddle, N.J., *JCS Chem. Comm.*, 1247 (1972).



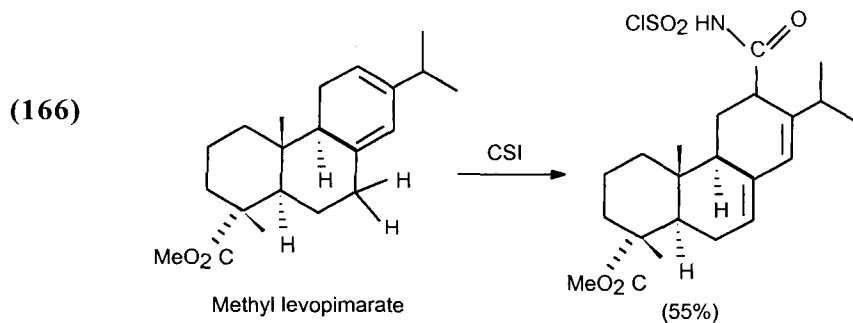
Malpass, J.R., Tweddle, N.J., *JCS Perkin Trans. I*, 874 (1977).



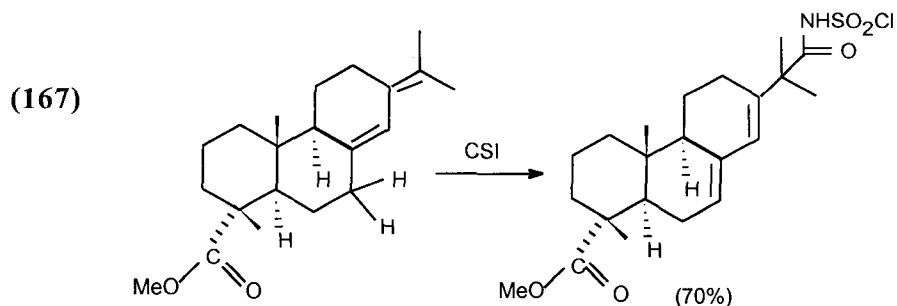
Malpass, J.R., Tweddle, N.J., *JCS Chem. Comm.*, 1247 (1972).



Barends, R.J.P., Speckamp, W.N., Huisman, H.O., *Tet. Lett.*, **11**, 5301 (1970).

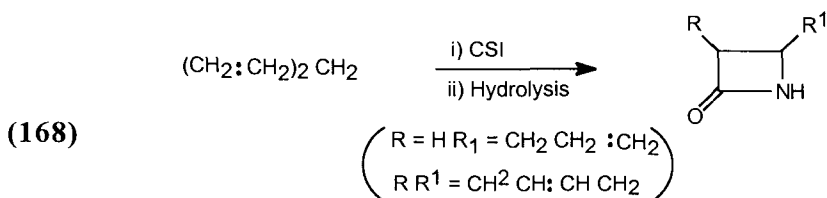


G. Mehta, Dhar, D.N., Suri, S.C., Bhadbade, M.M., Venkatesan, K., *Ind. J. Chem.*, **20B**, 193 (1981).

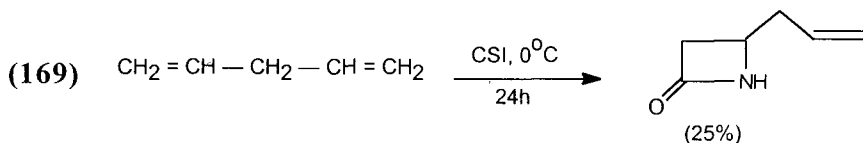


Metha, G., Dhar, D.N., Suri, S.C., Bhadbade, M.M., and Venkatesan, K., *Ind. J. Chem.*, **20B**, 193 (1981).

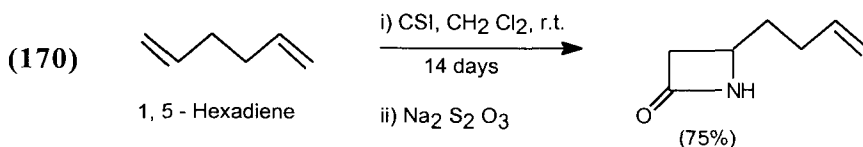
Unconjugated Dienes



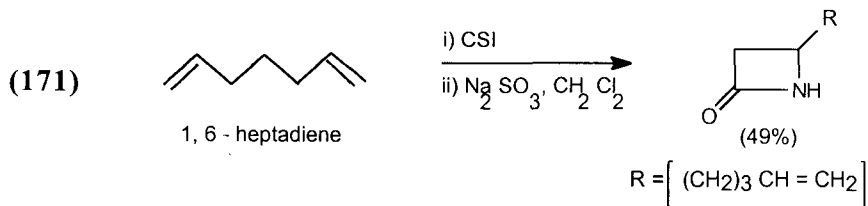
Baxter, A.J.G., Dickinson, K.H., Roberts, P.M., Smale, T.C., Southgate, R., *JCS Chem. Comm.*, 236 (1979).



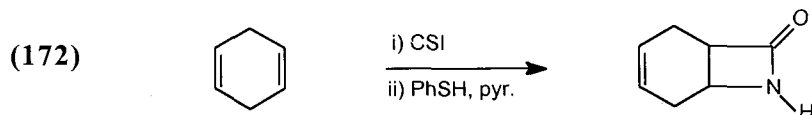
Pfaendler, H.R., Strasser, R., *Ann.*, 911 (1987).



Aida, T., Legault, R., Dugat, D., Durst, T., *Tet. Lett.*, **20**, 4993 (1979).

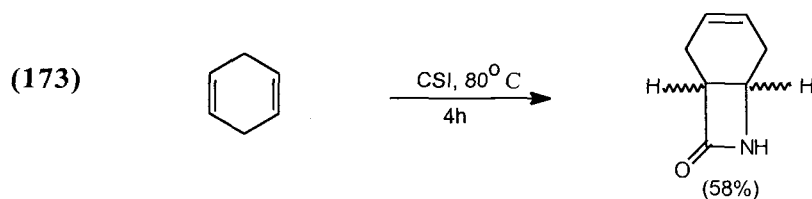


Barrett, A.G.M., Graboski, G.G., Sabat, M., Taylor, S.J., *JOC*, **52**, 4693 (1987).

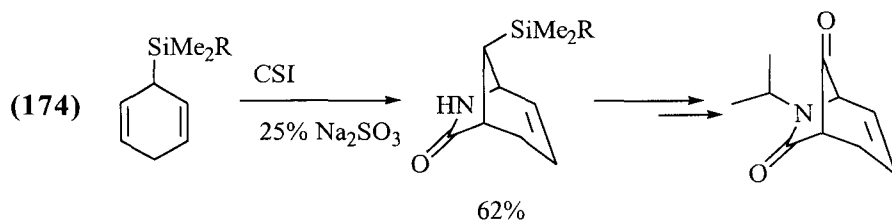


Paquette, L.A., Kakihana, T., *JACS*, **90**, 3897 (1968).

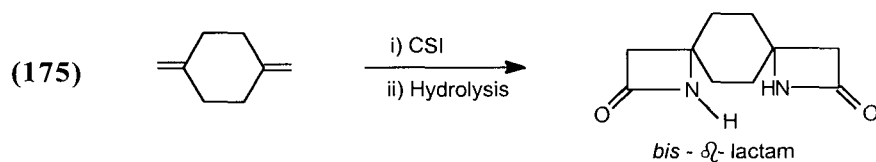
Paquette, L.A., Kakihana, T., Hansen, J.F., Philips, J.C., *JACS*, **93**, 152 (1971).



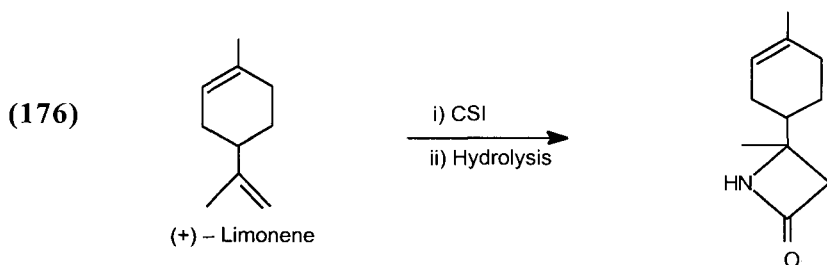
Singh, R, Cooper, R.D.G., *Tetrahedron*, **50**, 12049 (1994).



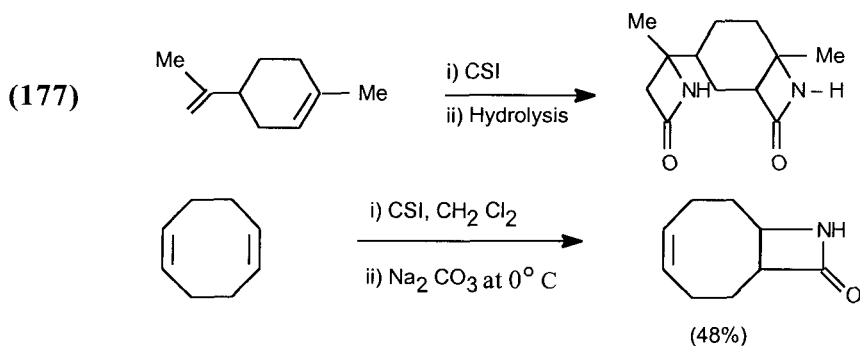
Roberson, C., Woerpel, K., *Org. Lett.*, **2**, 621, (2000).



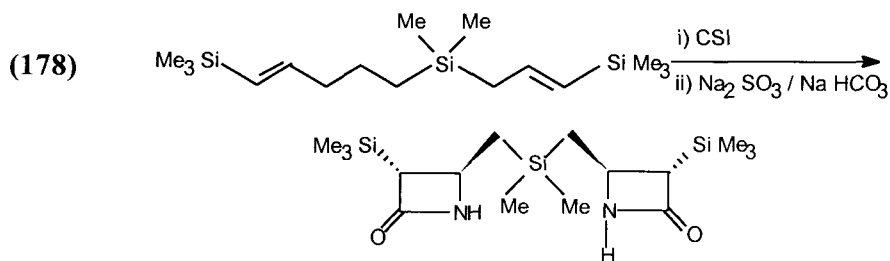
Biener, H., Farbwerke Hoechst A.G., unpublished results.



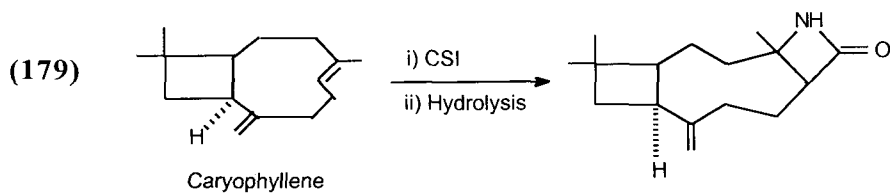
Mehta, G., Dhar, D.N., Suri, S.C., *Ind. J. Chem.*, **16B**, 87 (1978).



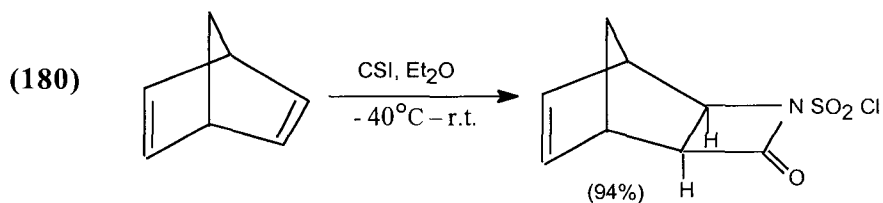
Parson, P.J., Camp, N.P., Underwood, J.M., Harvey, D.M., *JCS Chem. Comm.*, 1461 (1995).



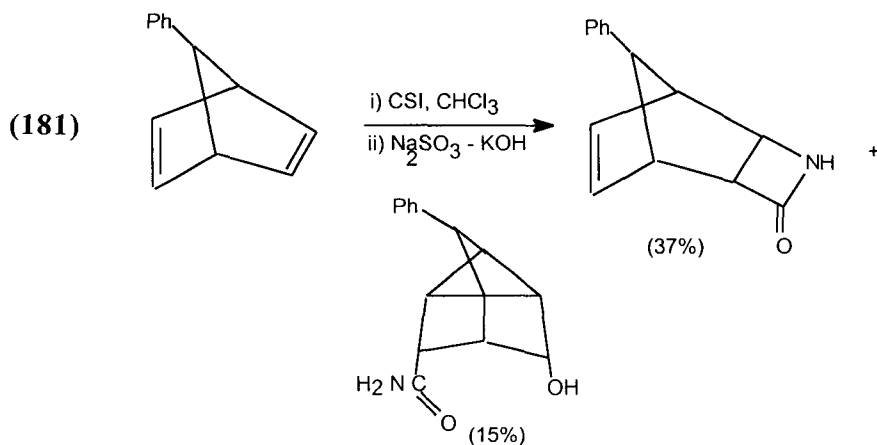
Nativi, C., Perrotta, E., Ricci, A., Taddei, M., *Tet. Lett.*, **32**, 2265 (1991).



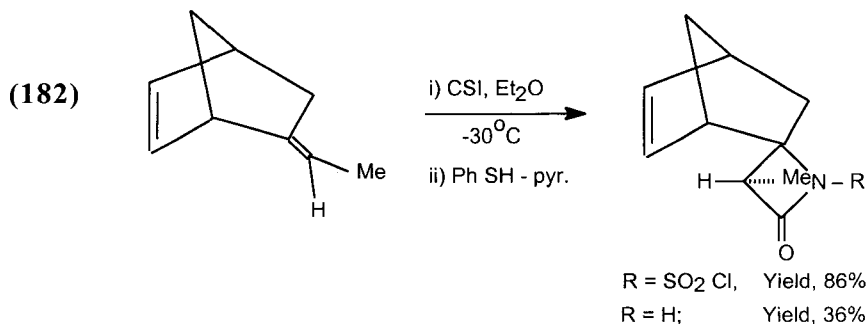
Mehta, G., Dhar, D.N., Suri, S.C., *Ind. J. Chem.*, **16B**, 87 (1978).



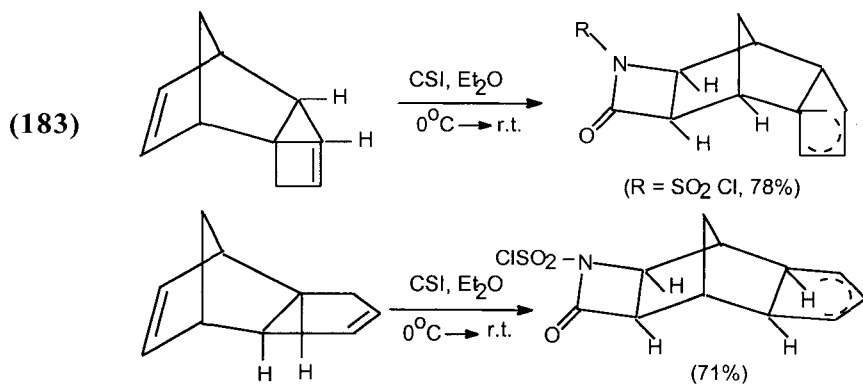
Moriconi, E.J., Wheeler, C., Crawford, W.C., *JOC*, **33**, 370 (1968).



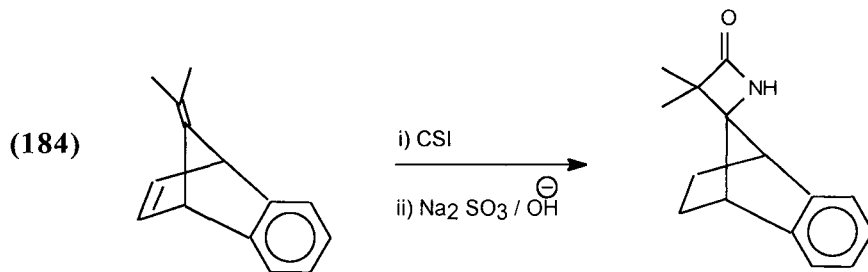
Mazzochi, P.H., Halchak, T., Ammon, H.L., *Tet. Lett.*, **20**, 2953 (1979).



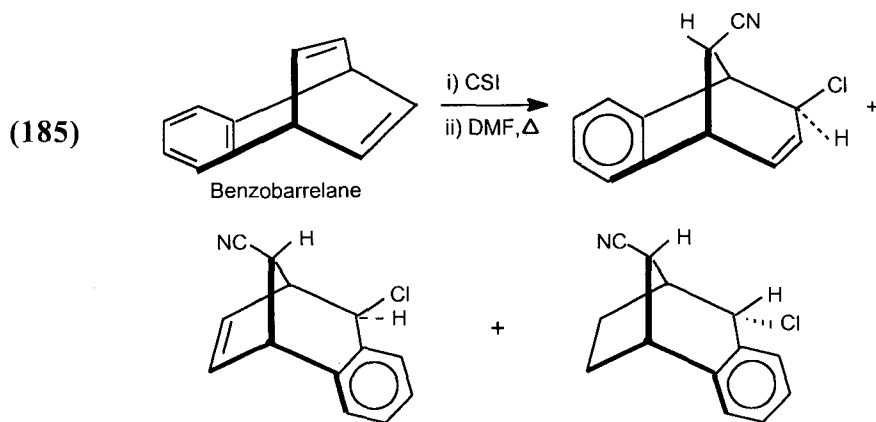
Moriconi, E.J., Jalandoni, C.C., *JOC*, **35**, 2073 (1970).



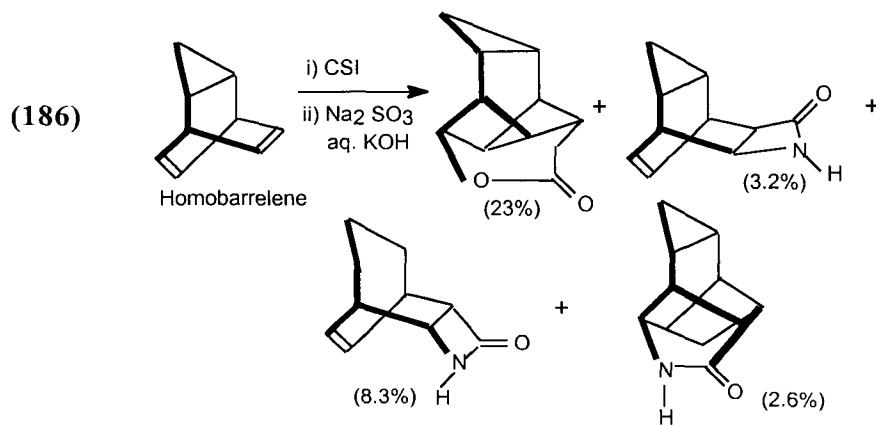
Moriconi, E.J., Wheeler, C., Crawford, W.C., *JOC*, **33**, 370 (1968).



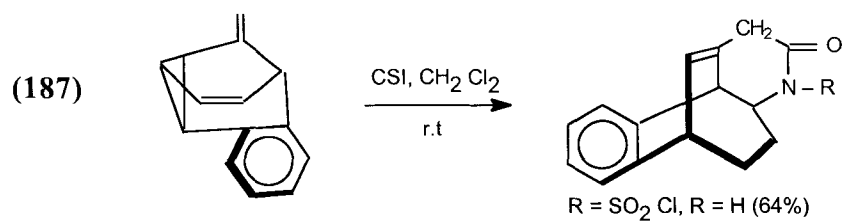
Sasaki, T., Hayakawa, K., Manabe, T., Nishida, S., *JACS*, **103**, 567 (1981).



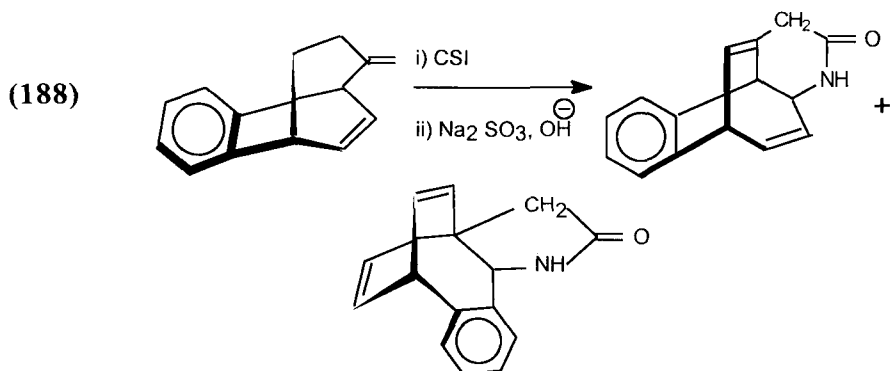
Paquette, L.A., Volz, W.E., *JACS*, **98**, 2910 (1976).



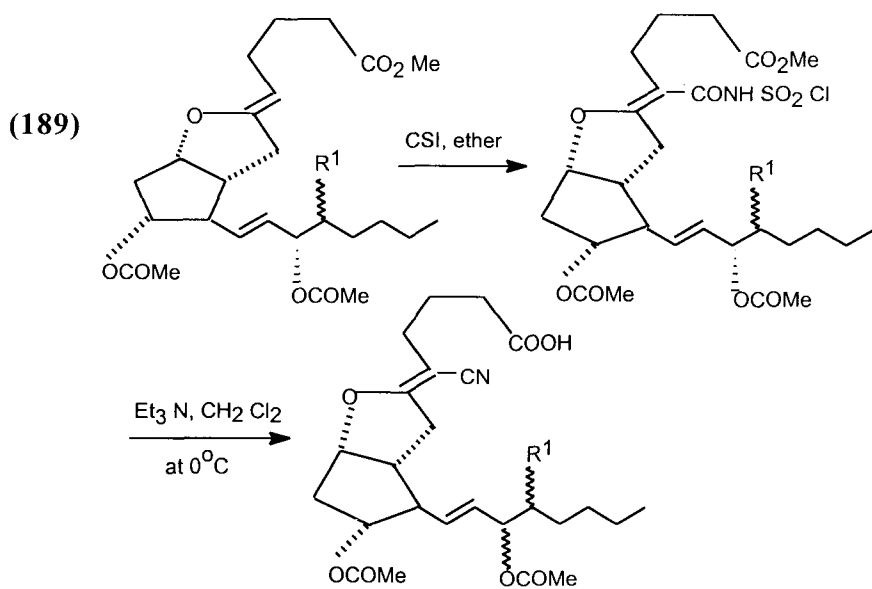
Volz, W.E., Paquette, L.A., *JOC*, **41**, 57 (1976).



Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).

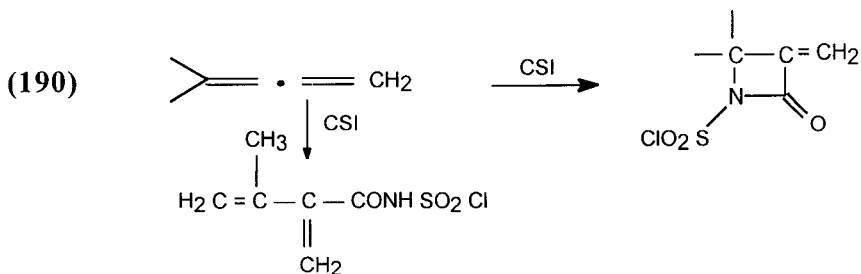


Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).

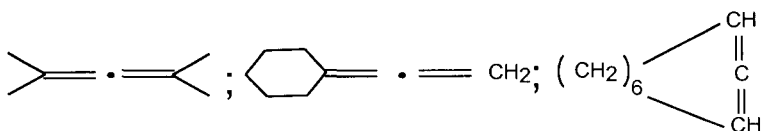


Skuballa, W., Raduechel, B., Vorbrueggen, H., *Tet. Lett.*, **29**, 4285 (1988).

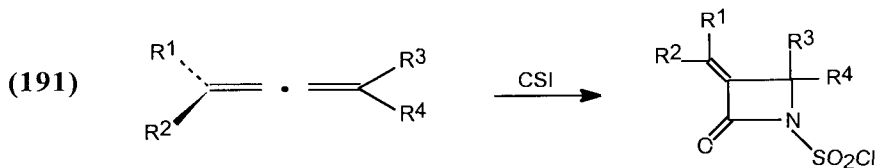
Allenes



Note: The following allenes are reported to react with CSI in a similar way:

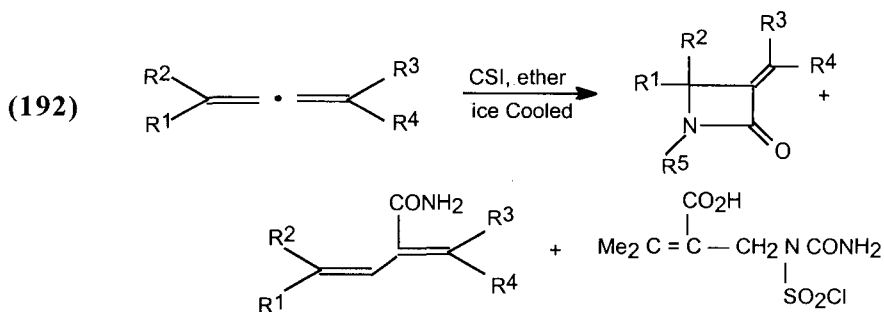


Moroconi E.J., Kelly, J.F., *JACS*, **88**, 3657 (1966).

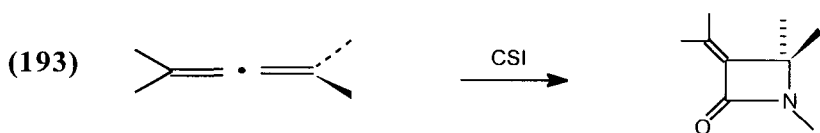


Moroconi, E.J., "Mechanism of Reactions of Sulfur compounds", vol. 3, Intra-Science Research Foundation, Santa Monica, Calif, p. 131 (1968).

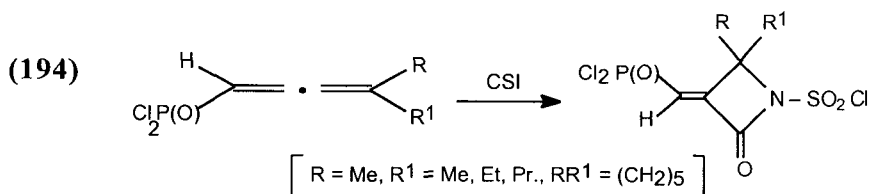
Bestian, H., "Cycloaddition with Sulfonyl - Isocyanate", *Pure Applied Chem.*, **27**, 611 (1971).



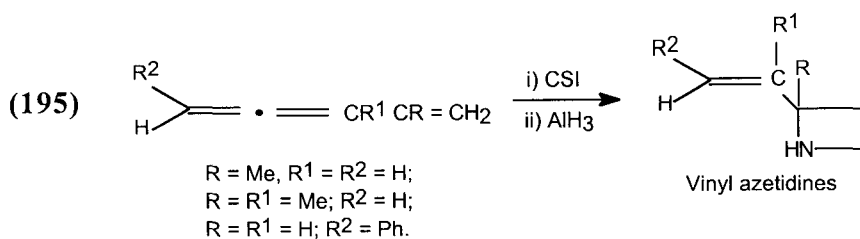
Moriconi, E.J., Kelly, J.F., *JOC*, **33**, 3036 (1968).



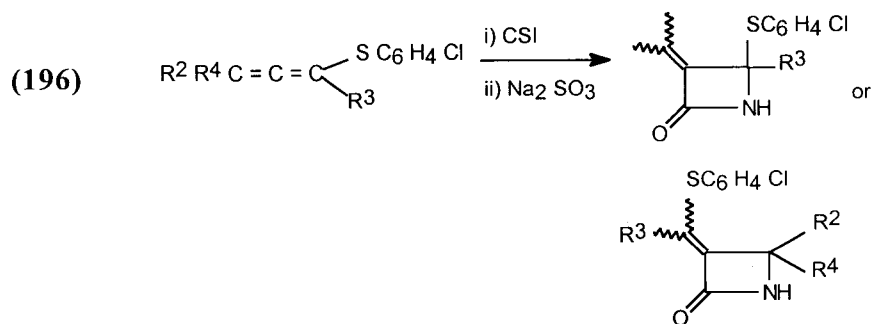
Cossio, F., Roa, G., Lecea, B., Ugalde, J.M., *JACS*, **117**, 12306 (1995).



Mondeshka, D., Parashikov, V., Angelov, Kh., *Synth. Comm.*, **19**, 3113 (1989).



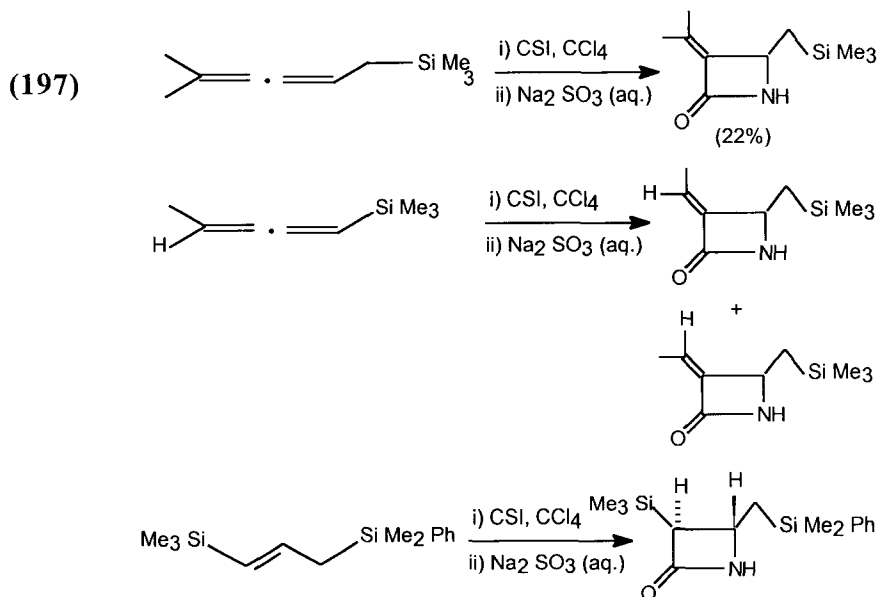
Hassner, A; Wiegand, N; *JOC*, **51**, 3652 (1986).



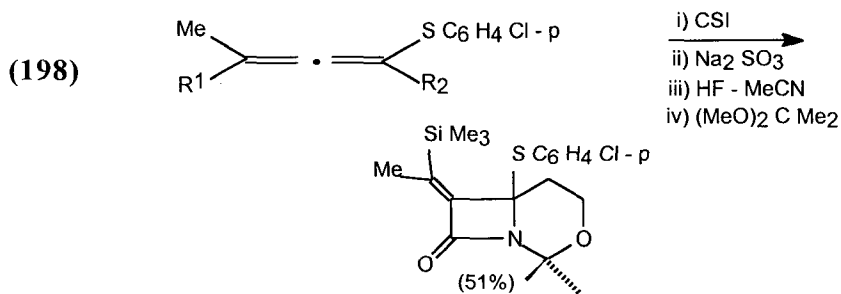
Table

Allene	Product	Yield (%)
		55
		87
		20
		54
		(a) 10% (b) 10% (a : b :: 1 : 2)
		(22%)

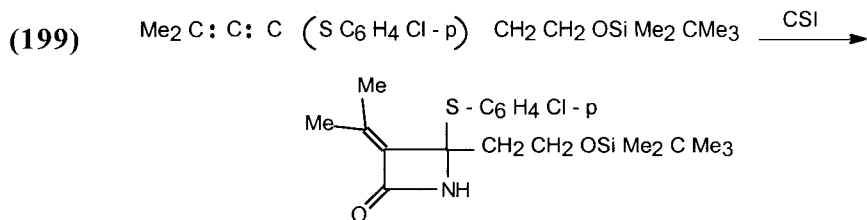
Buynak, J.D., Rao, M.N., Chandrasekaran, R.Y., Haley, E., De Meester, P., Chu, S.C., *Tet. Lett.*, **26**, 5001 (1985).



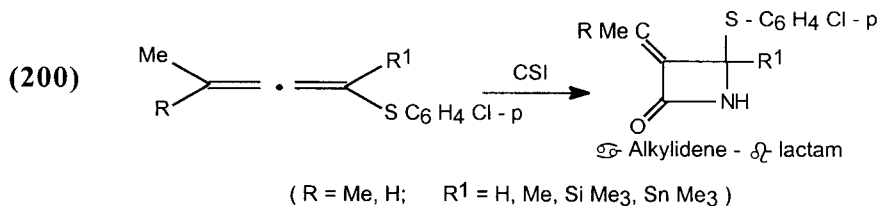
Colvin, E.W., Monteith, M., *JCS Chem. Comm.*, 1230 (1990).



Buynak, J.D., Mathew, J., Rao, M.N., Haley, E., George, C., Siriwardane, U. *JCS Chem. Comm.*, 735 (1987).

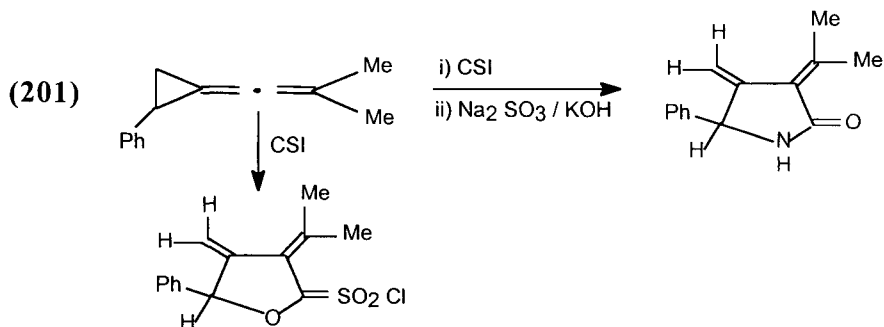


Buynak, K.D., Rao, M.N., *JOC*, **51**, 1571 (1986).

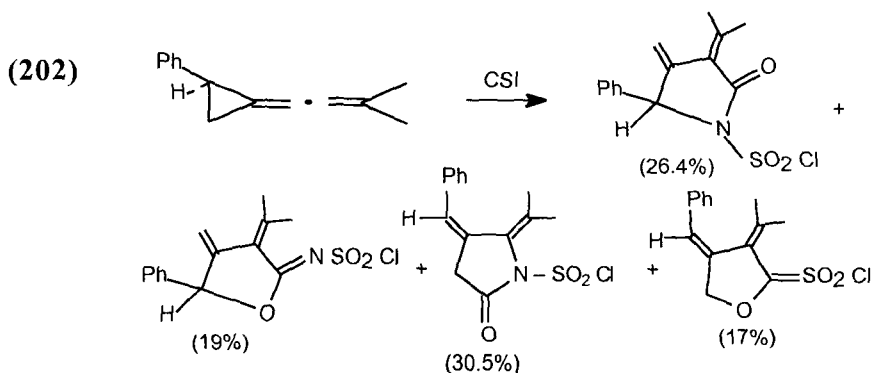


Buynak, J.D., Rao, M.N., Chandrasekaran, R.Y., Haley, E., De Meester, P., Chu, S.C., *Tet. Lett.*, **26**, 5001 (1985).

Buynak, J.D., Rao, M.N., *JOC*, **51**, 1571 (1986).



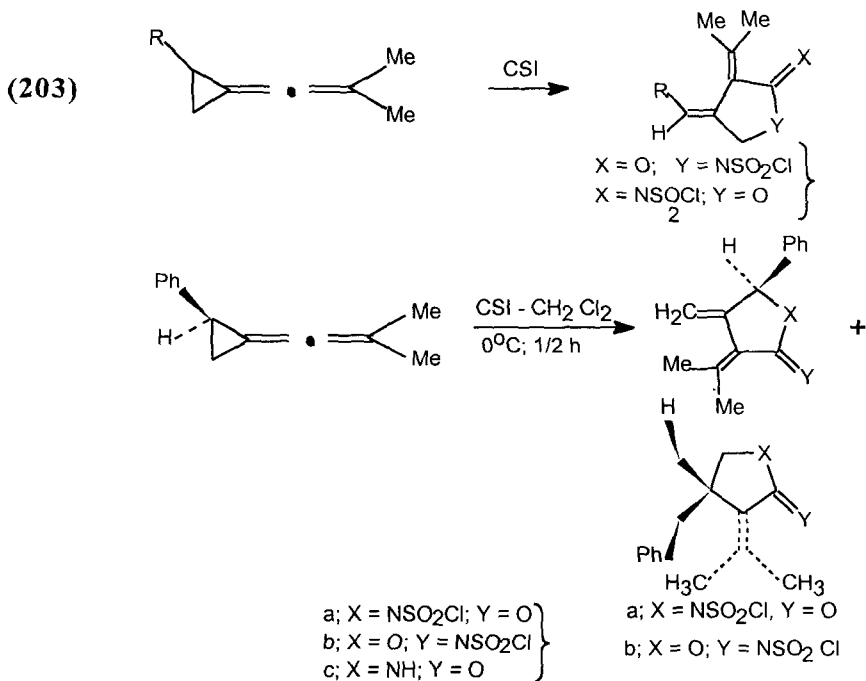
Gompper, R., Lach, D., *Tet. Lett.*, **14**, 2683 (1973).



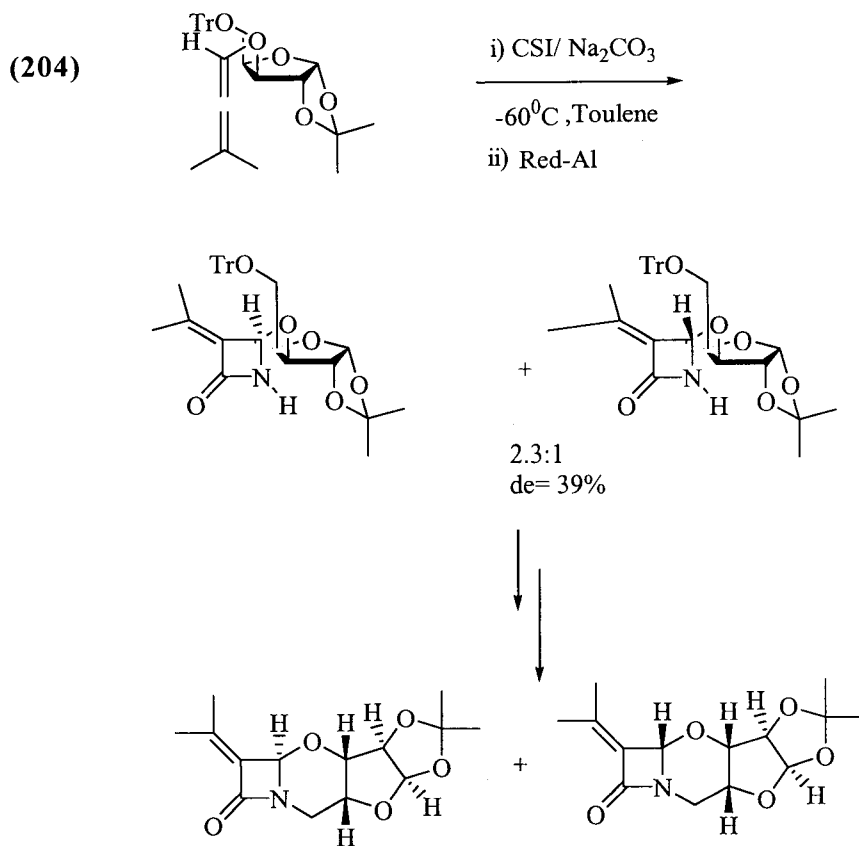
Gompper, R., Lach, D., *Tet. Lett.*, **14**, 2683 (1973).

Pasto, D.J., Chen, A.F.T., Ciurdaru, G., Paquette, L.A., *JOC*, **38**, 1015 (1973).

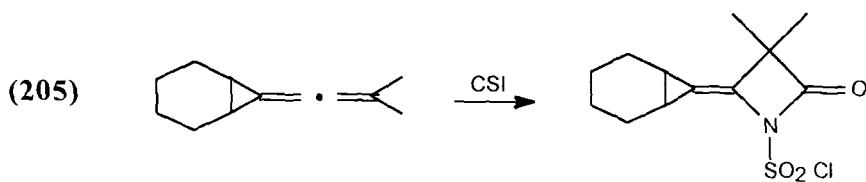
Pasto, D.J., Borchardt, J.K., *JACS*, **96**, 6220, (1974).



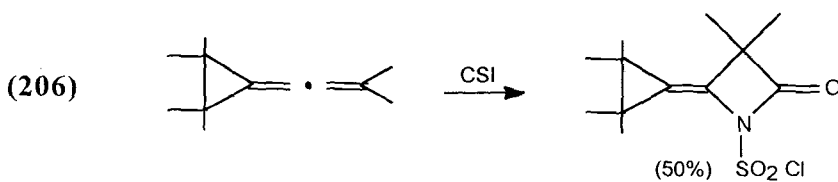
Pasto, D.J., Borchardt, J.K., *JACS*, **96**, 6937 (1974).



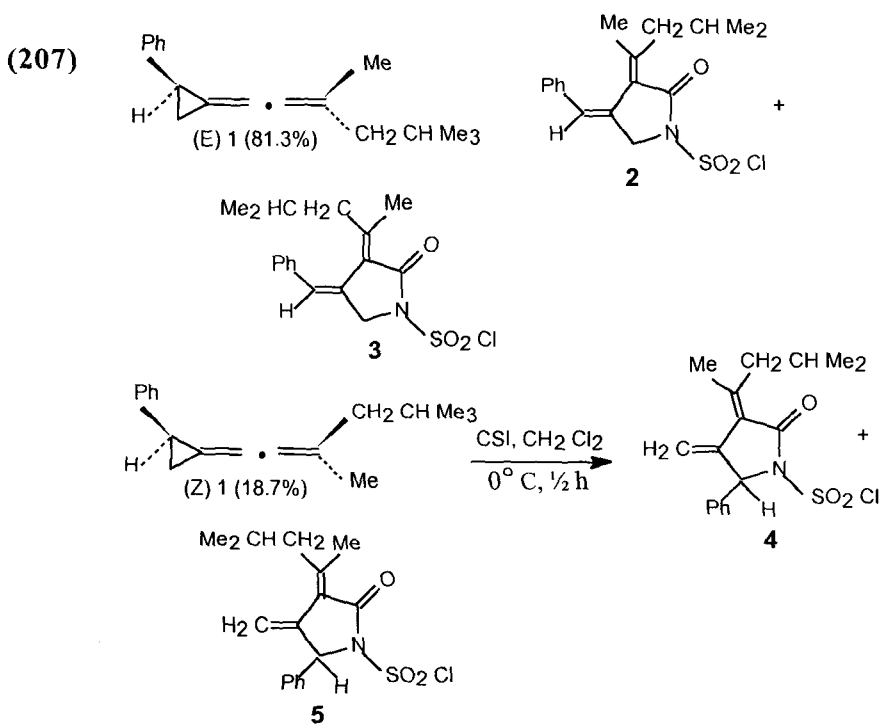
Lysek, R., Furman, B., Kaluza, Z., Frelak, J., Suwinska, K., Urbanczyk-Lipkowska, Z., Chmielewski, M., *Tet. Asymm.*, **11**, 3131, (2000).

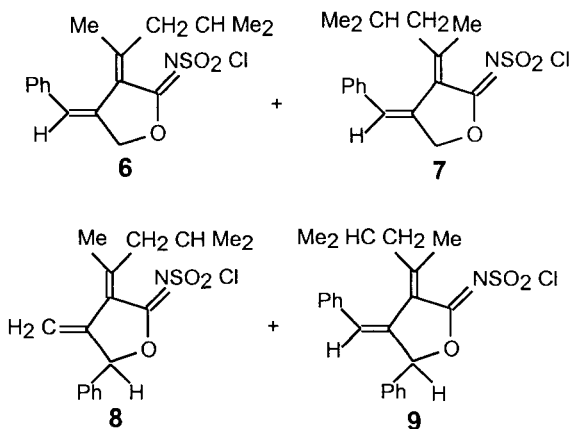


Gompper, R., Lach, D., *Tet. Lett.*, **14**, 2683 (1973).

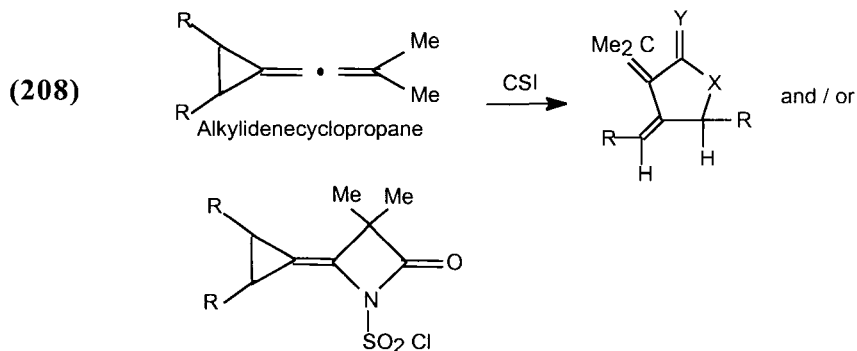


Poutsma, M.L. Iberbia, P.A. *JACS*, **93**, 440 (1971).



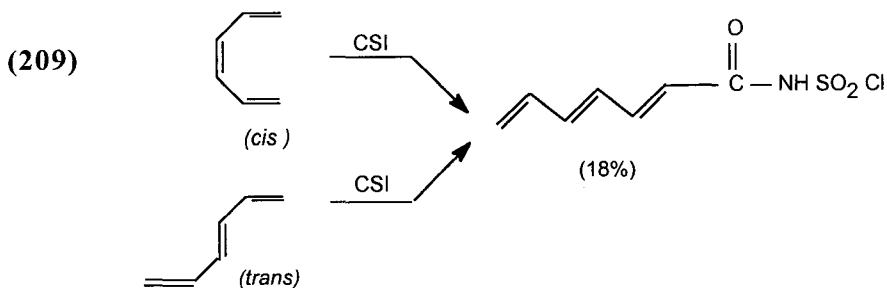


Pasto, D.J., Borchardt, J.K., *JACS*, **96**, 6937 (1974).

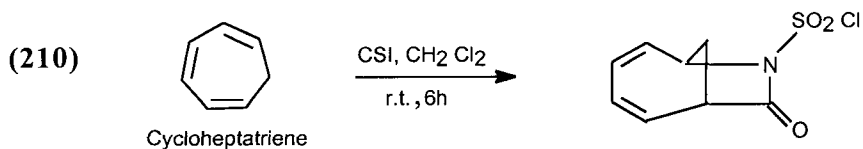


Pasto, D.J., Chen, A.F.T., Paquette, L.A., Ciurdaru, G., *Prep. Div., Pet. Chem., Am. Chem. Soc.*, **18**, 131 (1973).

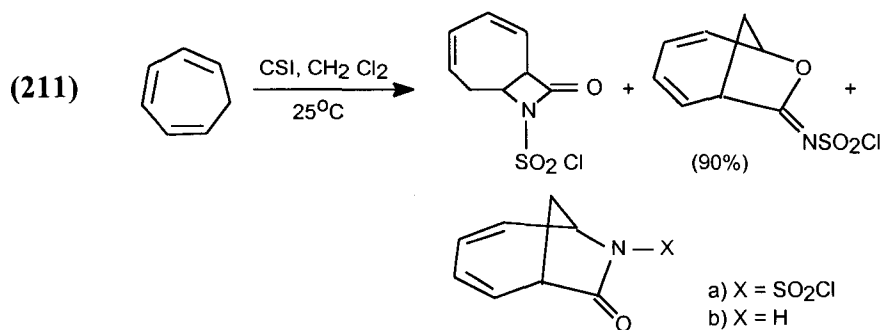
Conjugated Trienes



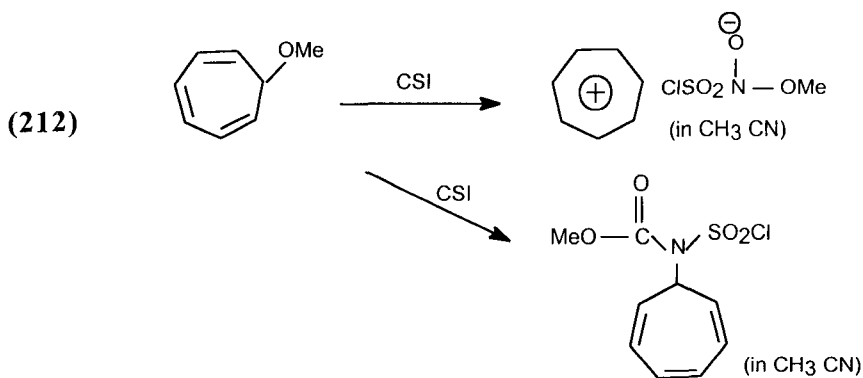
Moriconi, E.J., Hummel, C.F., *JOC*, **41**, 3583 (1976).



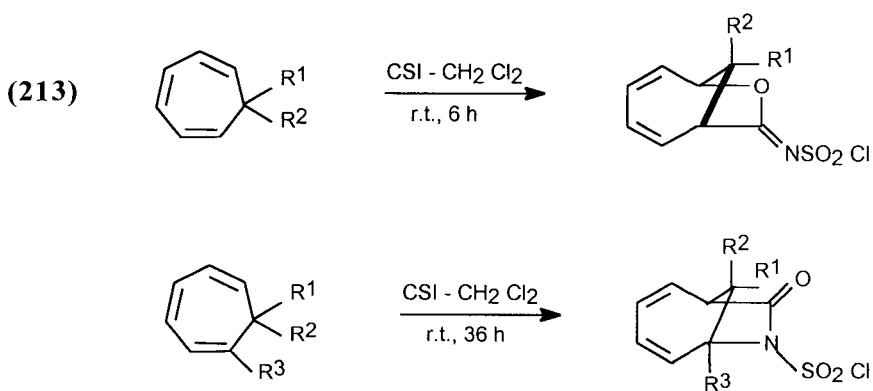
Moriconi, E.J., Hummel, C.F., Kelly, J.F., *Tet. Lett.*, **10**, 5325 (1969).



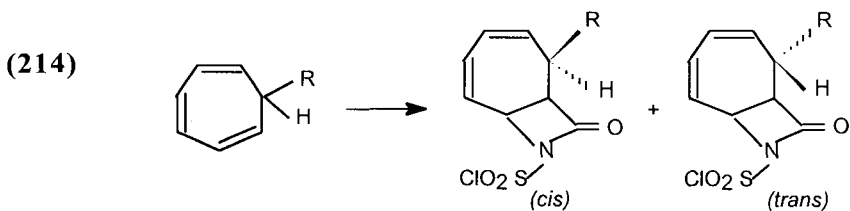
Malpass, J.R., *JCS Chem. Comm.*, 1246 (1972).



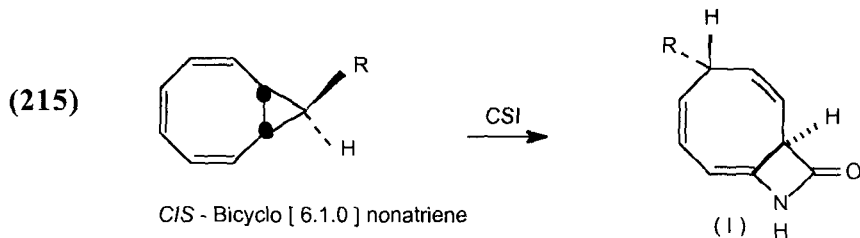
Pilidis, G., *Chem. Ber.*, **116**, 3516 (1983).



Moriconi, E.J., Hummel, C.F., *JOC*, **41**, 3583 (1976).



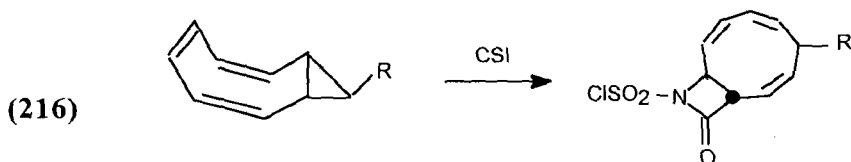
Moriconi, E.J., Hummel, C.F., *JOC*, **41**, 3583 (1976).



(I) R = H (60%), R = CH₃ (56%), R = Cl (15%)

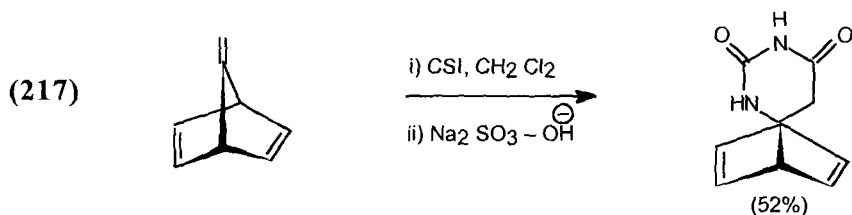
Paquette, L.A., Broadhurst, M.J., Lee, C., Clardy, J., *JACS*, **94**, 630 (1972).
JACS, **94**, 632 (1972). *JACS*, **95**, 4647 (1973).

Baldwin, J.E., Bryan, D.B., *JACS*, **96**, 319 (1974).

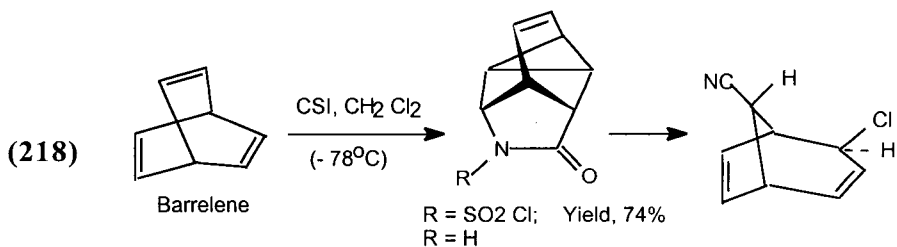


Baldwin, J.E., Bryan, D.B., *JACS*, **96**, 319 (1974).

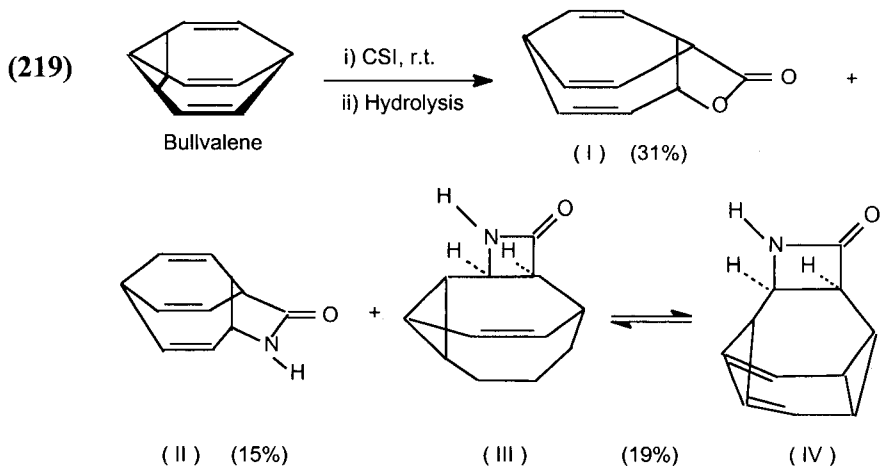
Unconjugated Trienes



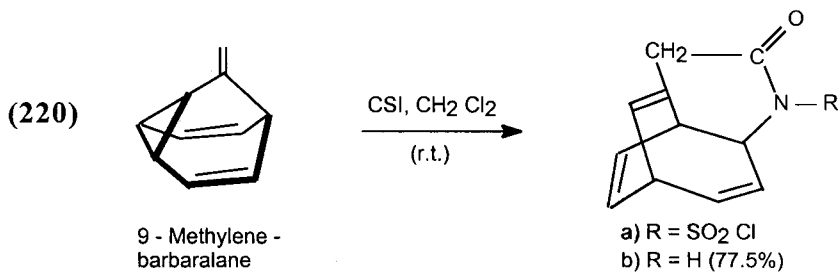
Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).



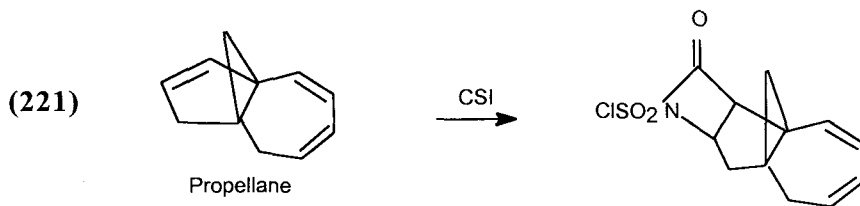
Paquette, L.A., Volz, W.E., *JACS*, **98**, 2910 (1976).



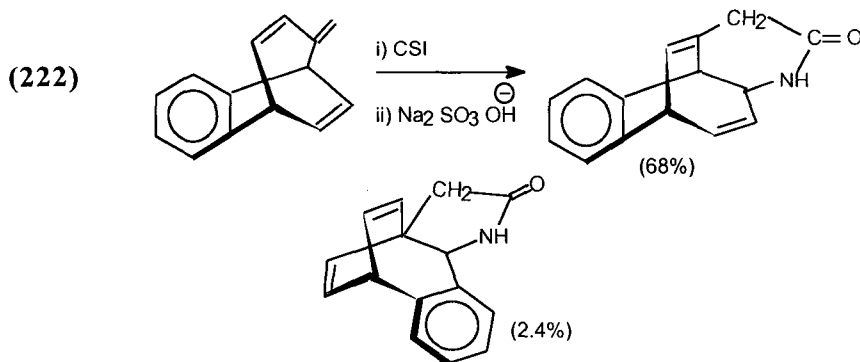
Paquette, L.A., Kirschner, S., Malpass, J.R., *JACS*, **92**, 4330 (1970)



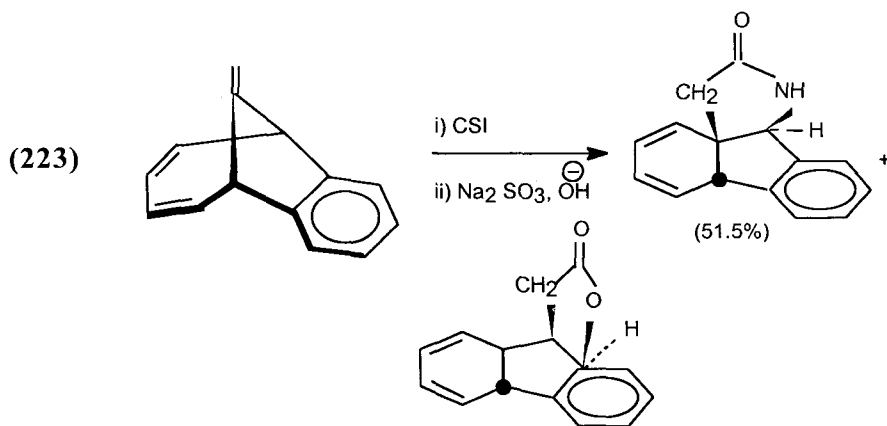
Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).



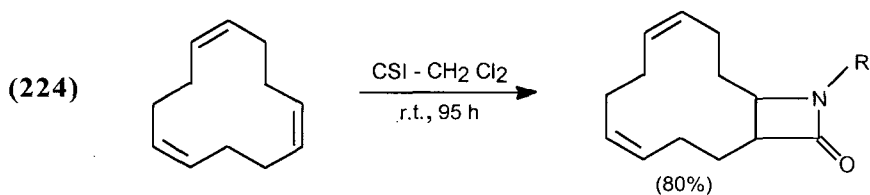
Scott, L.T., Erden, I., Brunsvold, W.R., Schultz, T.H., Houk, K.N., Paddon-Row, M.L., *JACS*, **104**, 3659 (1982).



Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).

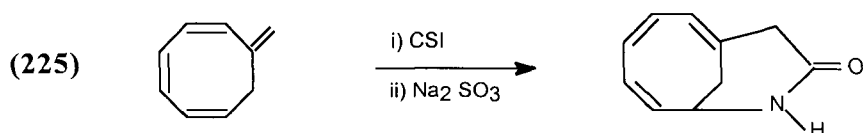


Paquette, L.A., Broadhurst, M.J., *JOC* **38**, 1893 (1973).

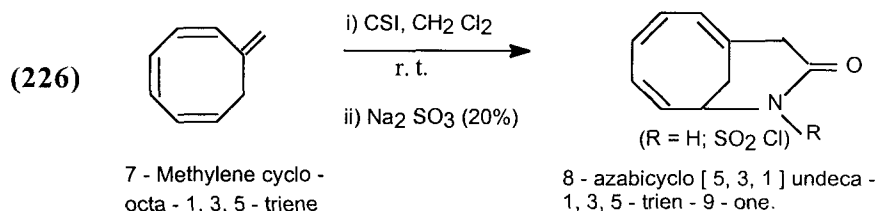


Moriconi, E.J., Hummel, C.F., *JOC*, **41**, 3583 (1976).

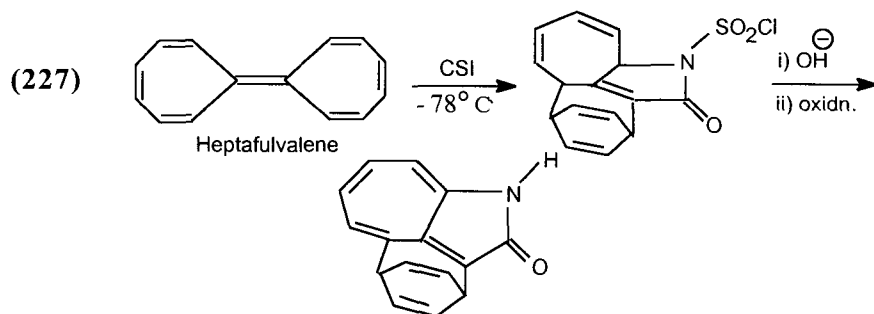
Conjugated Tetraenes



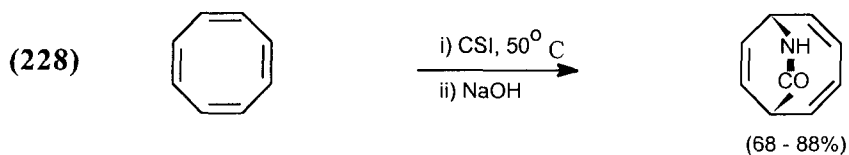
Ferber, P.H., Gream, G.E., Kirkbride, P.K., *Tet. Lett.*, **21**, 2447 (1980).



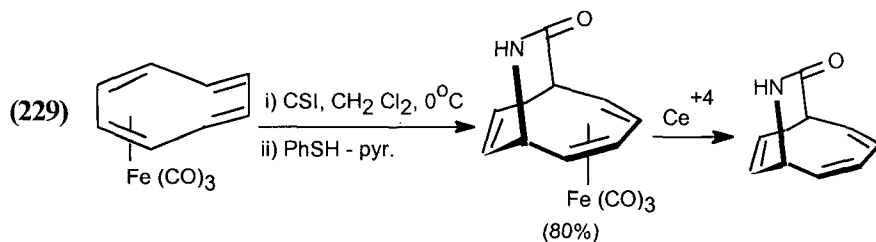
Ferber, P.H., Gream, G.E., Kirkbride, P.K., Tiekink, E.R.T., *Aus. J. Chem.*, **43**, 463 (1990).



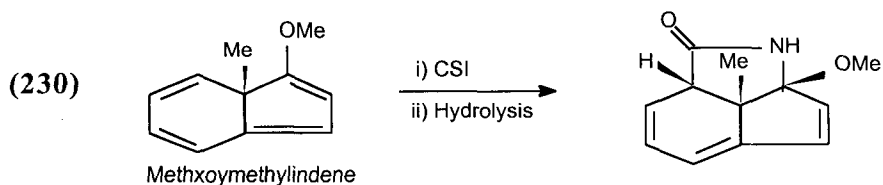
Erden, I., Kaufmann, D., *Tet. Lett.*, **22**, 215 (1981).



Paquette, L.A., Krow, G.R., Barton, T.J., in *"Organic Petrochemical Synthesis"*, Vol I, Srinivasan, R., (Ed.), John Wiley & Sons, Inc., New York, N.Y., 67 (1971).

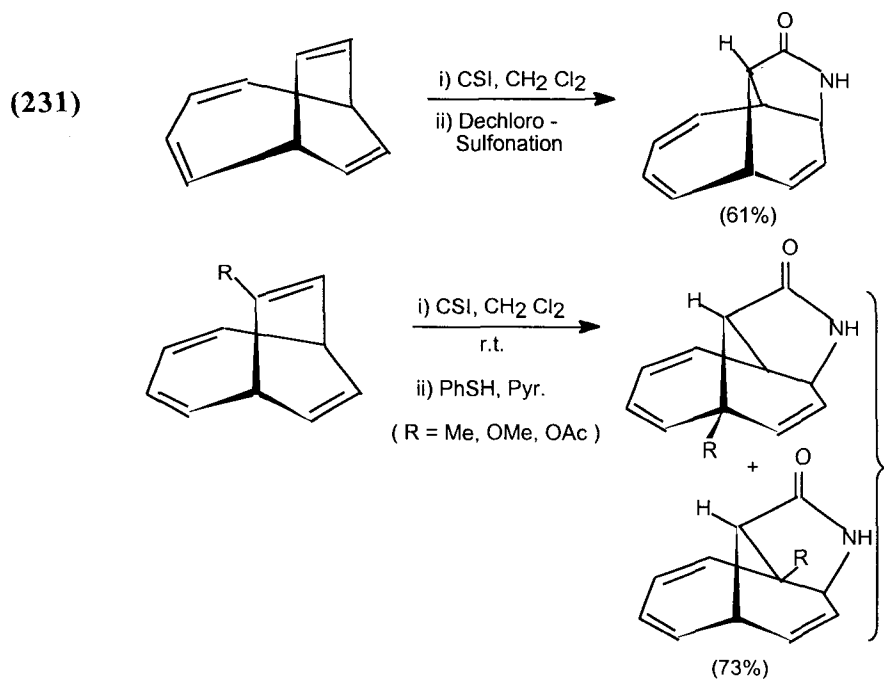


Paquette, L.A., Levy, S.V., Broadhurst, M.J., Truesdell, D., Foyos, J., Clardy, J., *Tet. Lett.*, **14**, 2943 (1973).

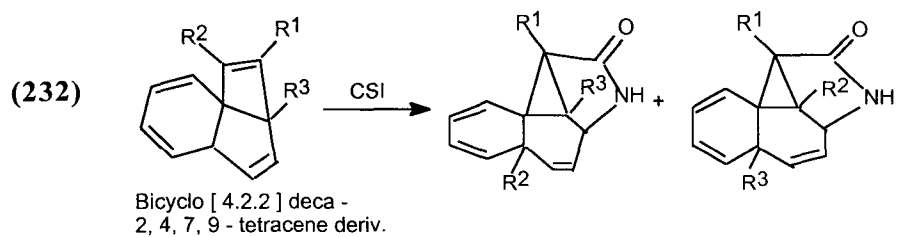


Gibbard, A.C., Moody, J.C., Rees, C.W., *JCS Perkin Trans. I*, 145 (1986).

Unconjugated Tetraenes

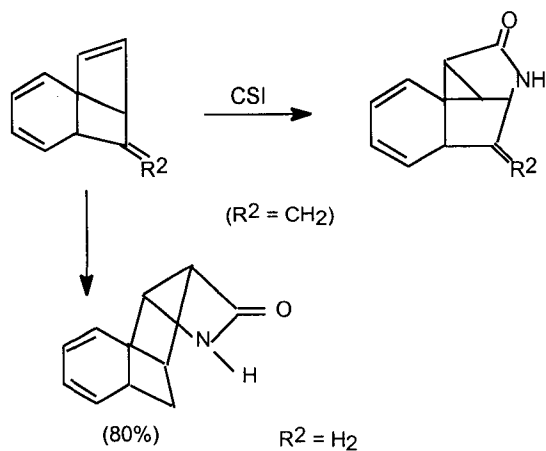


Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1888 (1973).

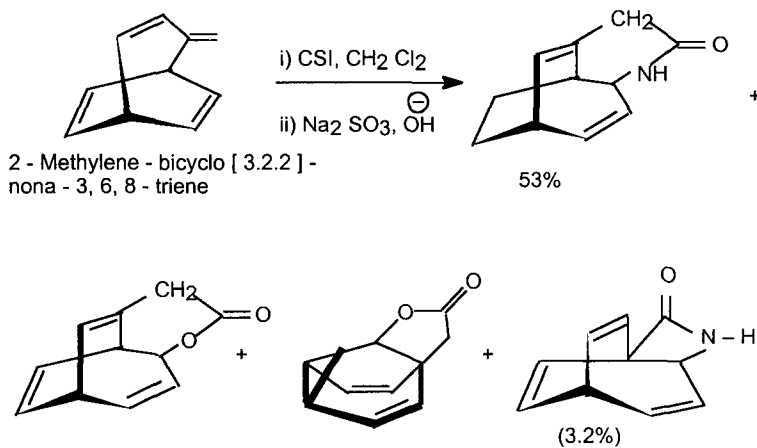


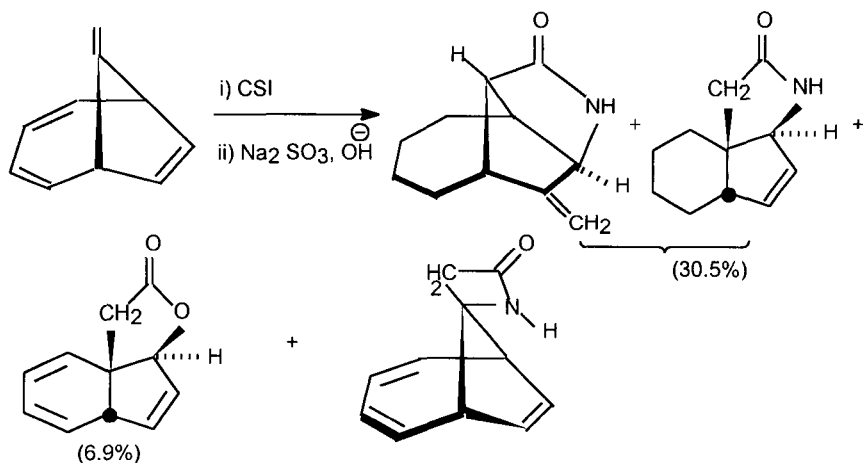
Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1886 (1973).

(233)

Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1886 (1973).

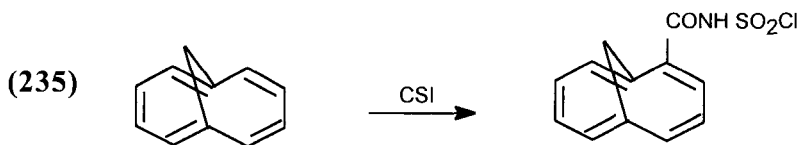
(234)

2 - Methylene - bicyclo [3.2.2] -
nona - 3, 6, 8 - triene

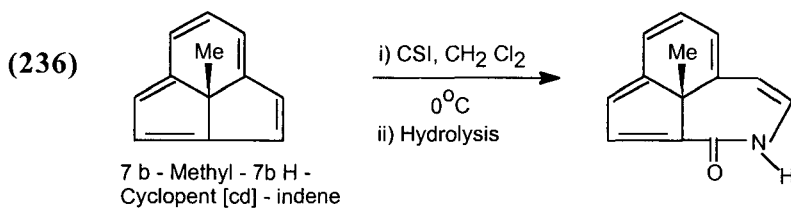


Paquette, L.A., Broadhurst, M.J., *JOC*, **38**, 1893 (1973).

Conjugated Pentaenes

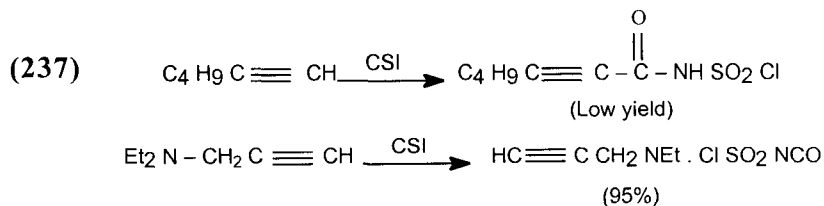


Effenberger, F., Klenk, H., *Chem. Ber.*, **109**, 769 (1976).

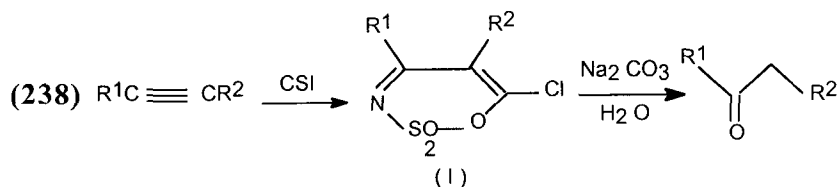


McCague, R., Moody, C.J., Rees, C.W., *JCS Perkin Trans. I*, 175 (1984).

Acetylenes



Moriconi, E.J., Shimakawa, Y., *JOC*, **37**, 196 (1972).



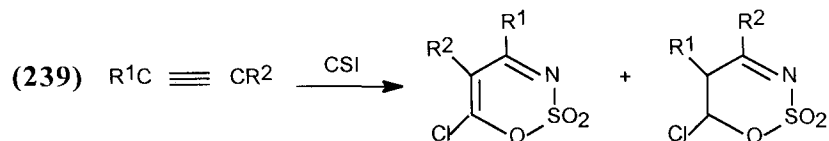
Substituents

I; % yield

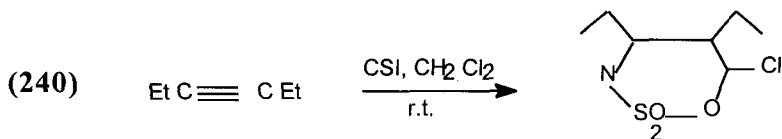
$\text{R}^1 = \text{R}^2 = \text{Me};$	42
$\text{R}^1 = \text{R}^2 = \text{Et};$	95
$\text{R}^1 = \text{R}^2 = n\text{-C}_3\text{H}_7;$	86
$\text{R}^1 = n\text{C}_3\text{H}_7; \text{R}^2 = \text{Me};$	92
$\text{R}^1 = \text{Me}_3\text{C}; \text{R}^2 = \text{Me};$	51
$\text{R}^1 = \text{Ph}; \text{R}^2 = \text{H};$	48
$\text{R}^1 = \text{C}_3\text{H}_7, \text{R}^2 = \text{MeCH}=\text{CH}_2$	90

Kobelt, D., Paulus, E.F., Kampe, K.D., *Tet Lett.*, **12**, 1211 (1971).

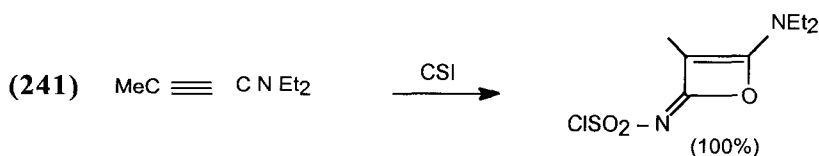
Kobelt, D., Paulus, E.F., Kampe, K.D., *Tet. Lett.*, **12**, 3627 (1971).



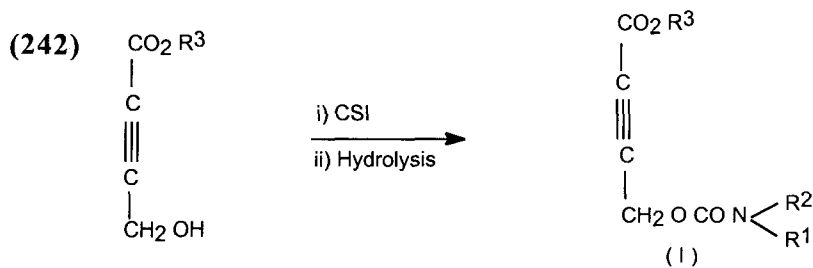
Moriconi, E.J., Shimakawa, Y., *JOC*, **37**, 196 (1972).



Moriconi, E.J., White, J.G., Franck, R.W., Jansing, J., Kelly, J.F., Salomone, R.A., Shimakawa, Y. *Tet. Lett.*, **11**, 27 (1970).



Moriconi, E.J., Shimakawa, Y., *JOC*, **37**, 196 (1972).

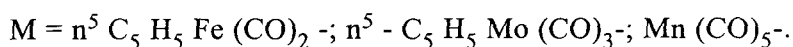
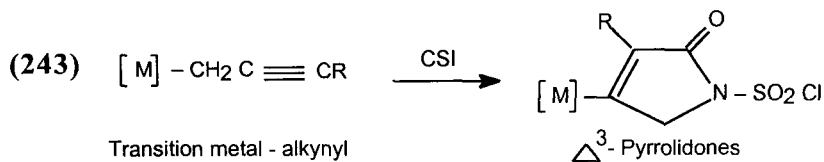


$\text{R}^1 = \text{R}^2 = \text{H}; \quad \text{R}^3 = \text{Me}; \quad \text{Yield, I} = 80\%$

$\text{R}^1 = \text{R}^2 = \text{H}; \quad \text{R}^3 = \text{Et}; \quad 83\%$

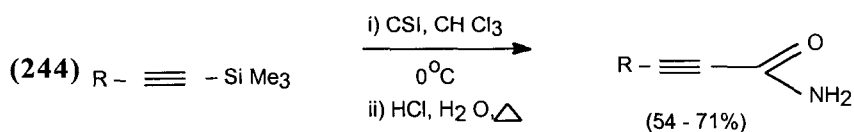
$\text{R}^1 = \text{R}^2 = \text{H}; \quad \text{R}^3 = \text{CH}_2\text{CH}_2\text{OC}_3\text{H}_7^{(n)} \quad 85\%$

Suzuki, K., Ushijima, R., Miyano, T., Nakagawa, S., *Heterocycles*, **29**, 497 (1988).

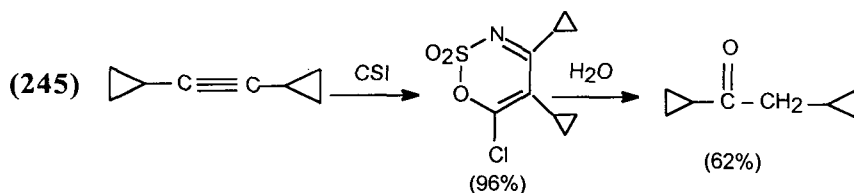


Yamamoto, Y., Wojcicki, A., *Inorg. Nucl. Chem. Lett.*, **8**, 833 (1972);
JCS Chem. Comm., 1088 (1972); *Inorg. Chem.*, **12**, 1779 (1973).

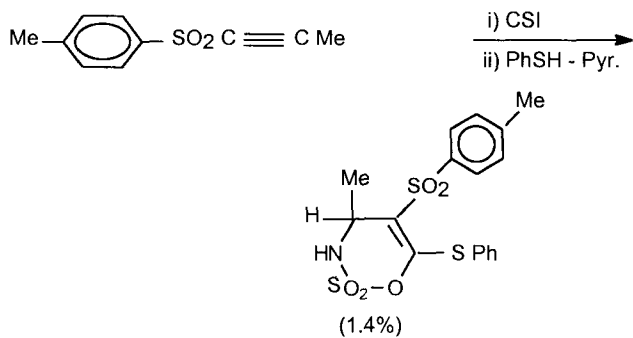
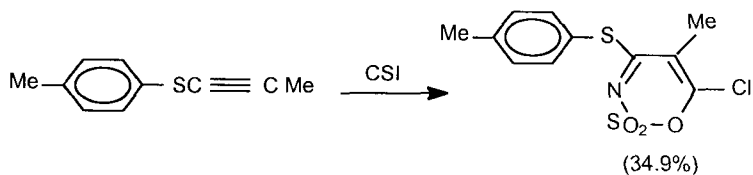
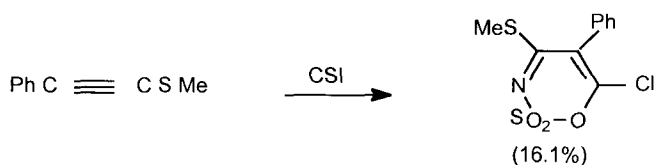
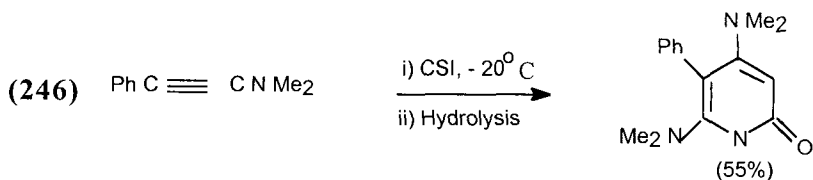
Giering, W.P., Raghu, S., Rosenblum, M., Cutler, A., Ehntholt, D., Fish, R.W., *JACS*, **94**, 8251 (1972).



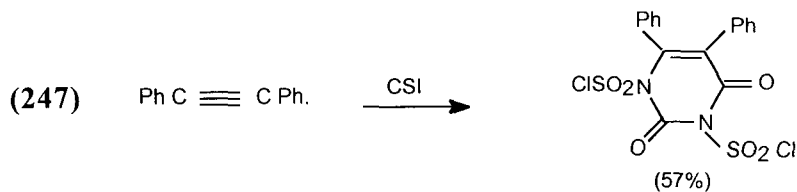
Page, P.C.B., Rosenthal, S., Williams, R.V., *Synthesis*, 621 (1988).



Kobrich, G, Merkel, D., Thiem, K-W., *Chem. Ber.*, **105**, 1683 (1972).

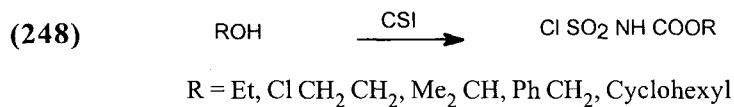


Hirai, K., Matsuda, H., Kishida, Y., *Ann. Sankyo Res. Lab.*, **24**, 108 (1972);
C.A., **78**, 159569^z (1973).



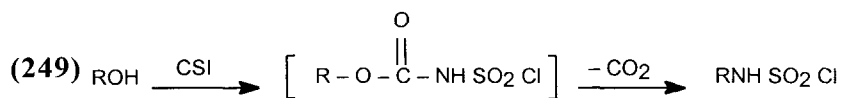
Moriconi, E.J., Shimakawa, Y., *JOC*, **37**, 196 (1972).

Alcohols

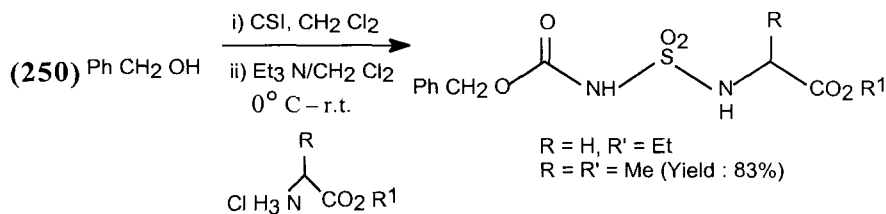


Graf, R., *Chem. Ber.*, **96**, 56 (1963).

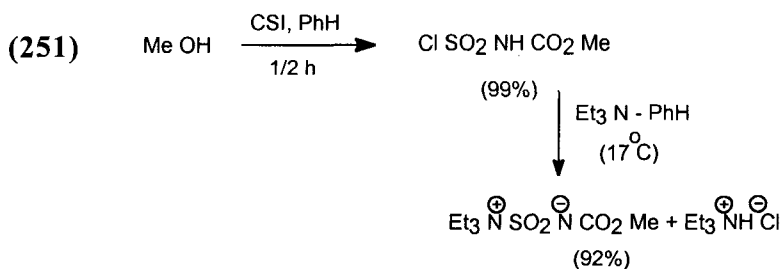
Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).



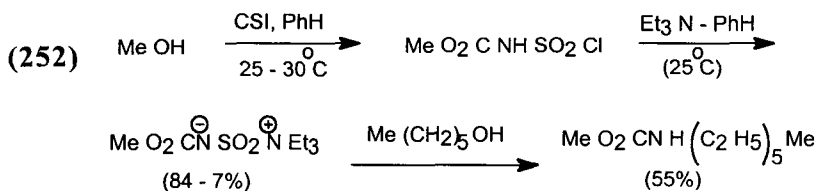
Timberlake, J.W., Ray (Jr.), W.J., Stevens, E.D., Klein, C.L., *JOC*, **54**, 5824 (1989).



Muller, G.W., DuBois, G.E., Grant, E., *JOC*, **54**, 4471 (1989).

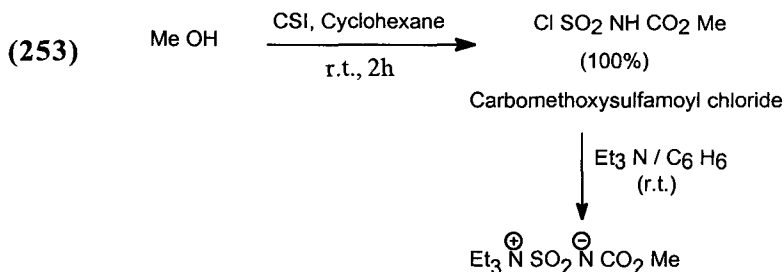


Duncan, J.A., Hendricks, R.T., Kwong, K.S., *JACS*, **112**, 8433 (1990).

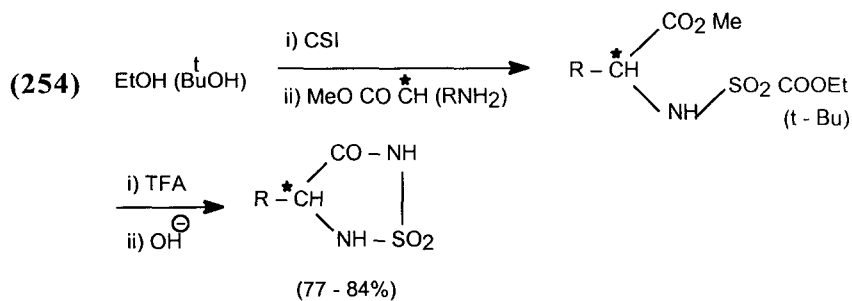


Burgess, E.M., Penton (Jr.), H.R., Taylor, E.A., Williams, W.M., *Org. Synth.*, **53**, 1857 (1973).

Burgess, E.M., Penton (Jr.), H.R., Taylor, E.A., Williams, W.M., *Org. Synth.*, **56**, 40 (1977).

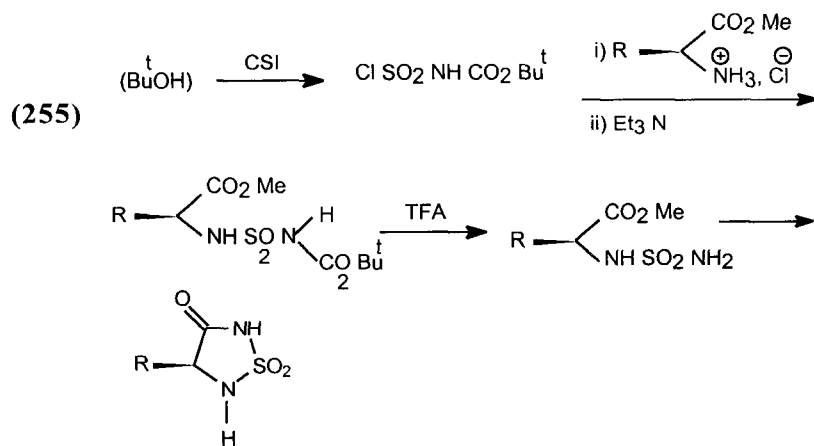


Duboudin, J.G., Minh, D.T., *Synth. Comm.*, **19**, 285 (1989).

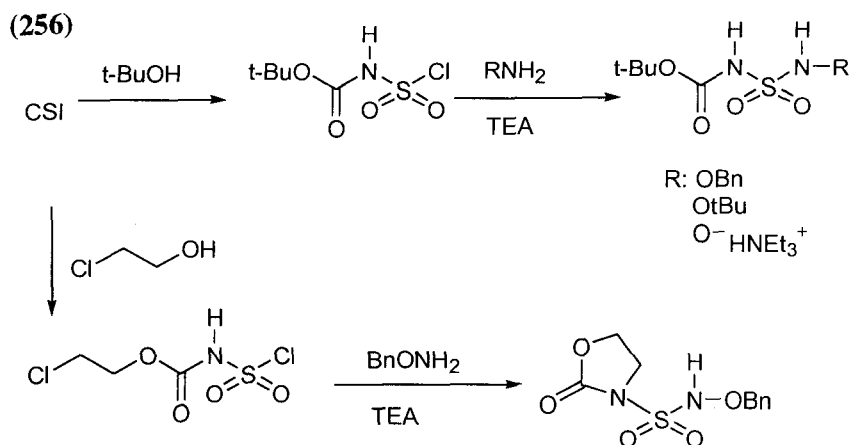


R = Pro; Asp; Met; Phe; Ala; Va.

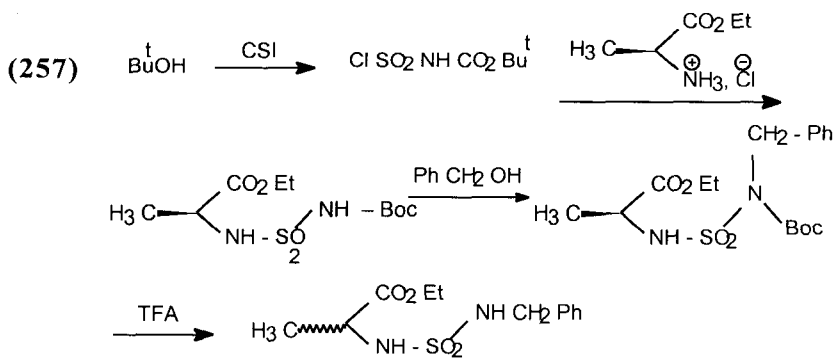
Aouf, N., Dewynter, G., Montero, J.L., *Tet. Lett.*, **32**, 6545 (1991).



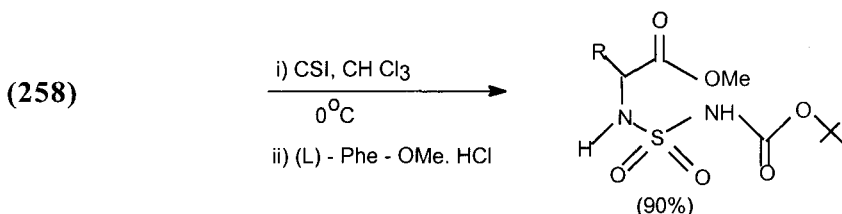
Dewynter, G., Aouf, N., Regainia, Z., Montero, J.L., *Tetrahedron*, **52**, 993 (1996).



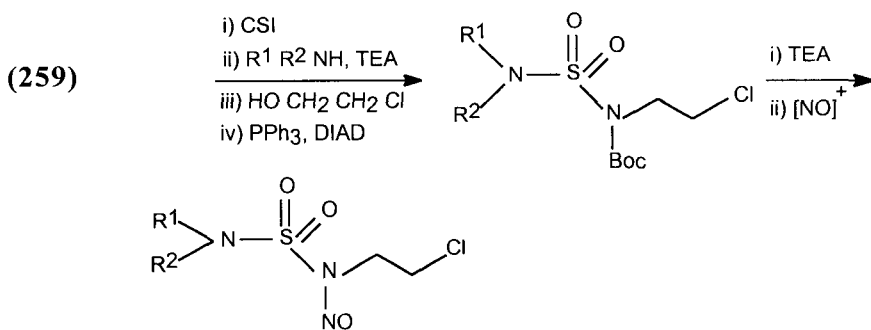
Hajri, A., Dewynter, G., Criton, M., Dilda, P., Montero, J., *Heteroat. Chem.*, **12**, 1 (2001).



Dewynter, G., Aouf, N., Criton, M., Montero, J.L., *Tetrahedron*, **49**, 65 (1993).

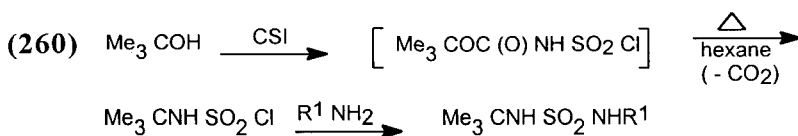


Groutas, W.C., Kuang, R., Venkataraman, R., *Biochem. Biophys. Res. Comm.*, **198**, 341 (1994).

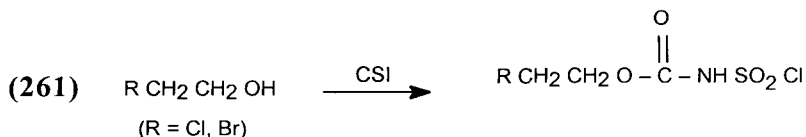


2 - Chloroethylnitrososulfamides (CENS)

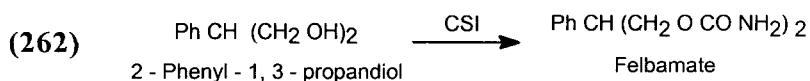
Abdaoui M., Dewynter, G., Aouf, N., Favre, G., Morere, A., Montero, J.L., *Biorg. Med. Chem.*, **4**, 1227 (1996).



Timberlake, J.W., Alender, J., Garner, A.W., Hodges, M.L., Özmeral, C., Szilagy, S., Jacobus, J.O. *JOC*, **46**, 2082 (1981).

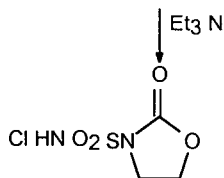
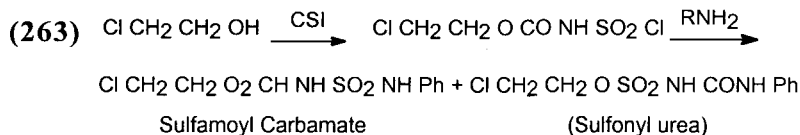


Agoh, B., Dewynter, G., Montero, J.L., Leydet, A., Imbach, J.L., *Bull. Soc. Chim. Fr.*, 867 (1987).

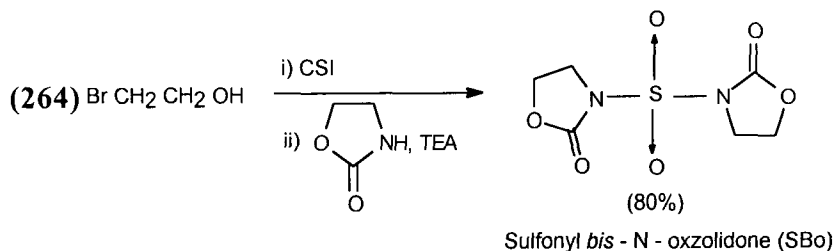


Walker, D., Babad, E., Tann, C.H., Tsai, D.J.S., Kwok, D.L., Belsky, K.A., Herczeg, L.J., (Schering Corp., USA).

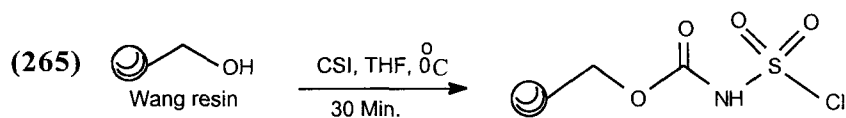
PCT Int. Appl., WO 940 6737, C.A., **121**, 204976 (1994).



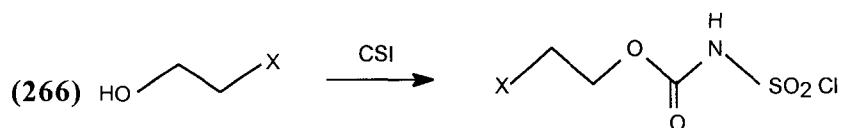
Montero, J.L., Dewynter, G., Agoh, B., Delaunay, B., Imbach, J.L., *Tet. Lett.*, **24**, 3091 (1983).



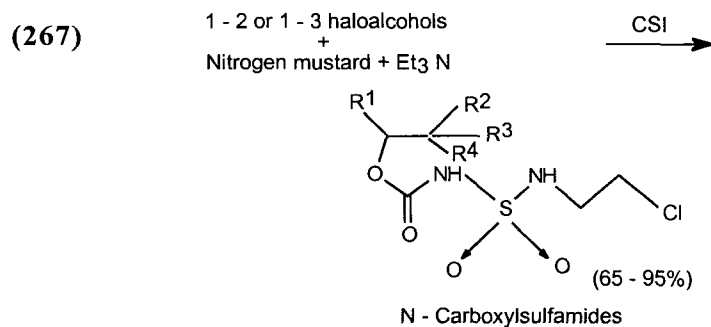
Dewynster, G., Abdaoui, M., Toupet, L., Montero, J.L., *Tet. Lett.*, **38**, 8691 (1997).



Fitzpatrick, L.J., Rivero, R.A., *Tet. Lett.*, **38**, 7479 (1997).



Agoh, B., Dewynster, G., Montero, J.L., Leydet, A., Imbach, J.L., *Bull. Soc. Chim. France*, 867 (1987).



Halo-alcohols

Chloro - and Bromoethanol, $R^1 = H, Me, CH_2Cl, H, H, H$

1 - Chloro - 2 - propanol, $R^2 = H, H, H, H, H, Me$

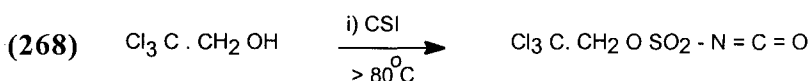
1, 3 - Dichloro - 2 - propanol, $R^3 = H, H, H, Br, H, Me$

2, 3 - Dibromo - 1 - propanol, $R^4 = Cl, Cl, Cl, CH_2 Br, CH_2 Cl, CH_2 Cl$

3 - Chloro - 1 - propanol

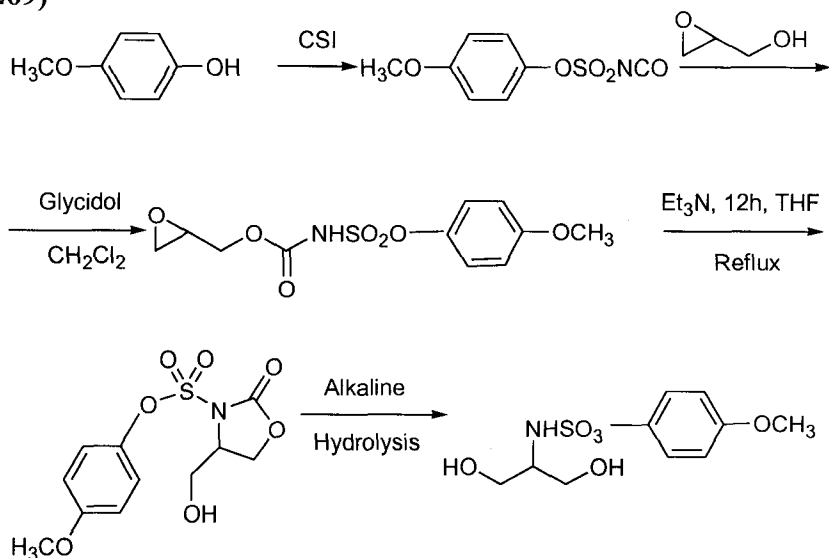
2, 2 - Dimethyl - 3 - Chloro - 1 - propanol.

Dewnyter, G., Abdaoui, M., Regainia, Z., Montero, J.L., *Tetrahedron*, **52**, 14217 (1996).

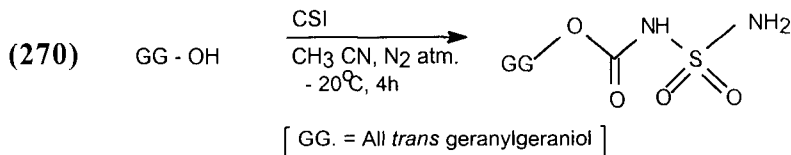


Lohaus, G., (Farbwerke Hoechst A.G.), DAS 1230017, 1965.

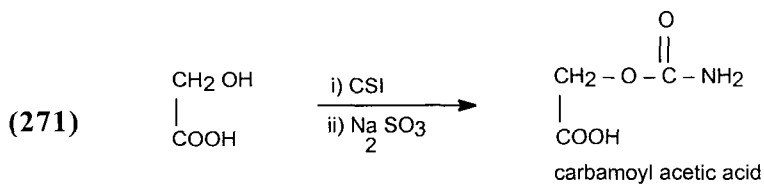
(269)



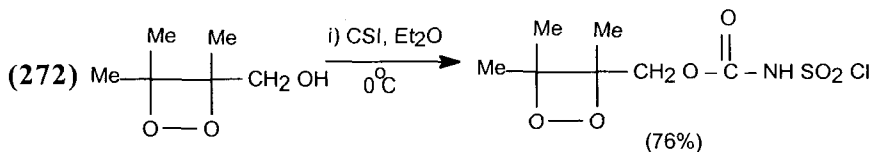
Gautun, H., Bergan, T., Carlsen, P., *Acta Chem. Scand.*, **53**, 446 (1999).



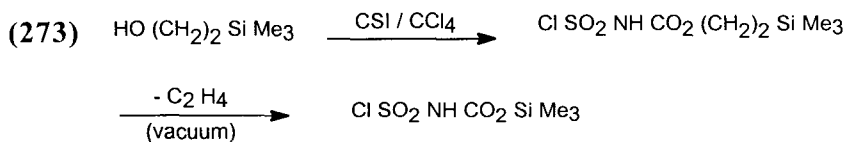
Macchia, M., Jannitti, N., Gervasi, G., Danesi, R., *J. Med. Chem.*, **39**, 1252 (1996).



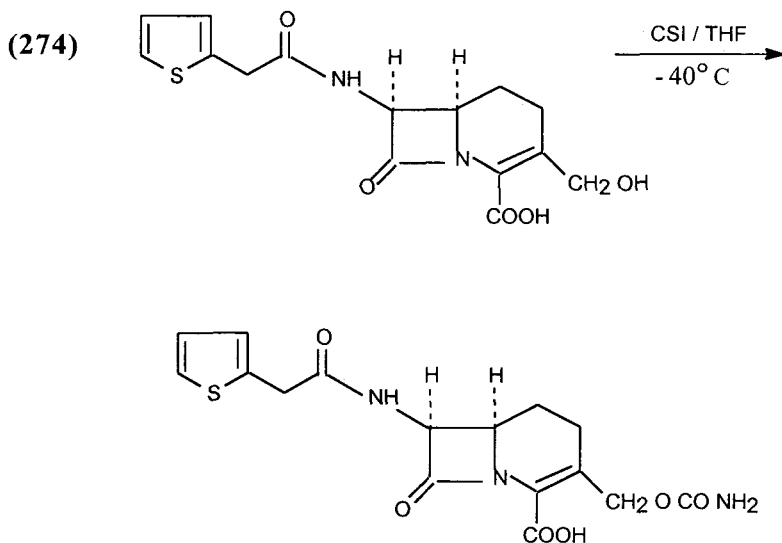
Battistini, C., Scarafile C., Vioglio, S., Perrone, E., Franceschi, G., *Tet. Lett.*, **27**, 513 (1986).



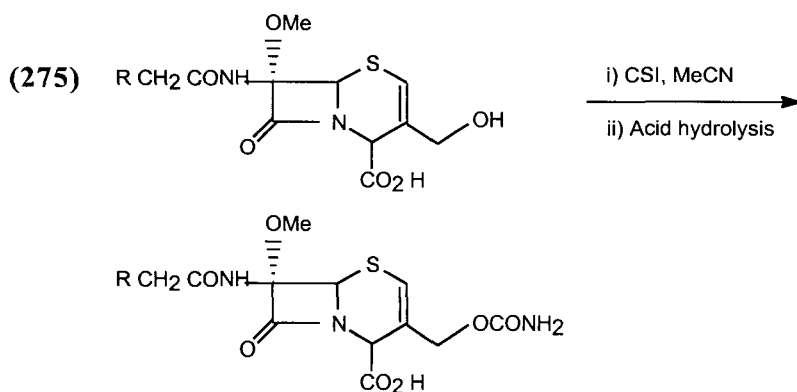
Adam, W., Bhushan, V., Fuchs, R., Kirchgaessner, U., *JOC*, **52**, 3059 (1987).



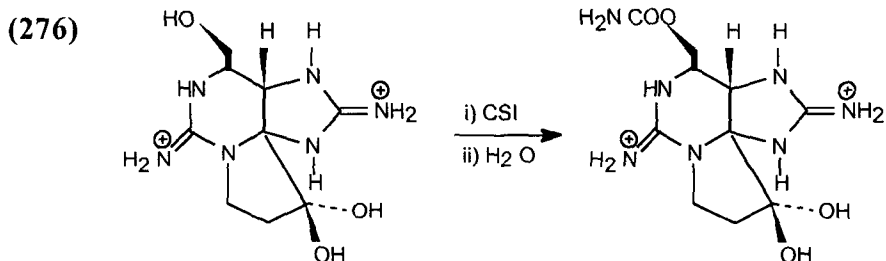
Durham, P.J., Galemno (Jr.), R.A., *Tet. Lett.*, **27**, 123 (1986).



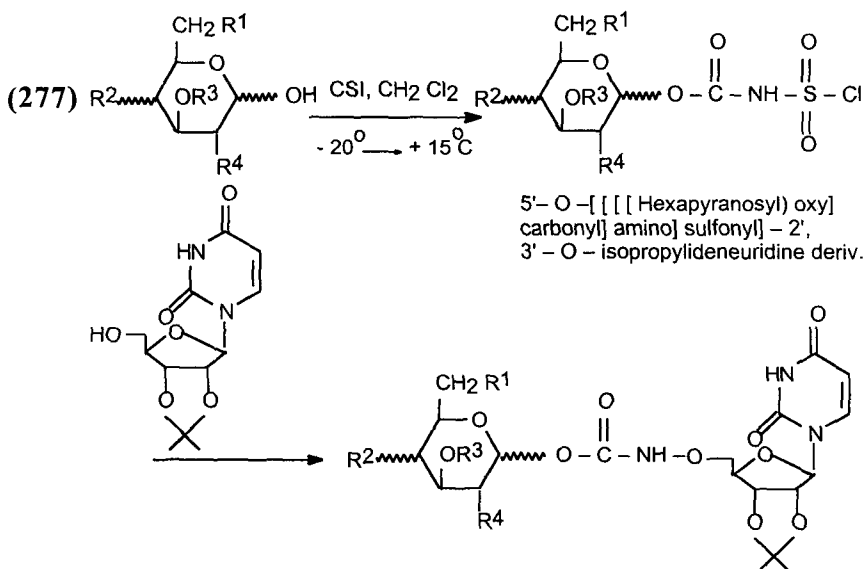
Firestone, R.A., Fahey, J.L. Maciejewicz, N.S., Patel, G.S., Christensen, B.G., *J. Med. Chem.*, **20**, 551 (1977).



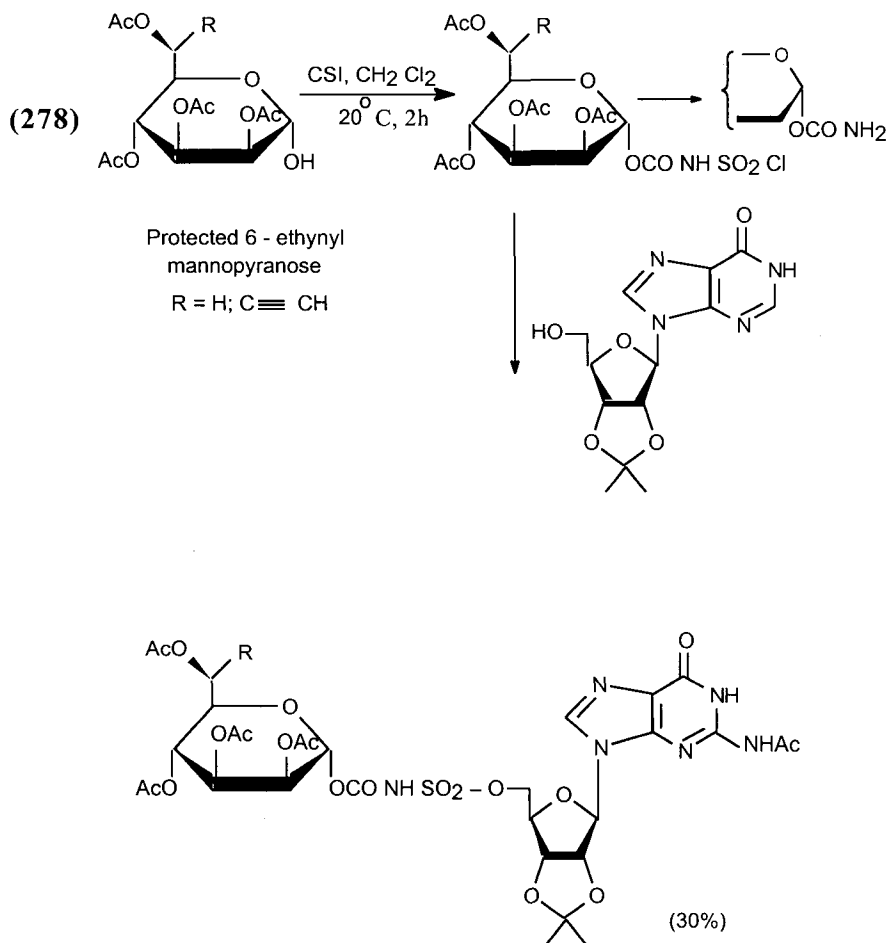
Rasmussen, J.K., Hassner, A., *Chem. Revs.*, **76**, 389 (1976).
 Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).



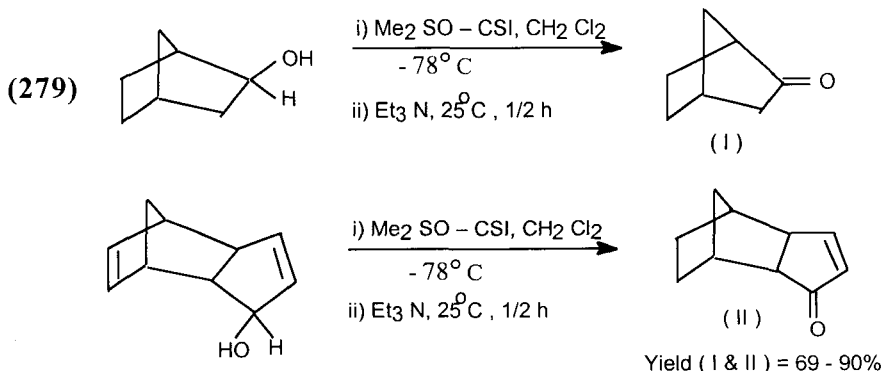
Tanino, H., Nakata, T., Kaneko, T., Kishi, Y., *JACS*, **99**, 2818 (1977).



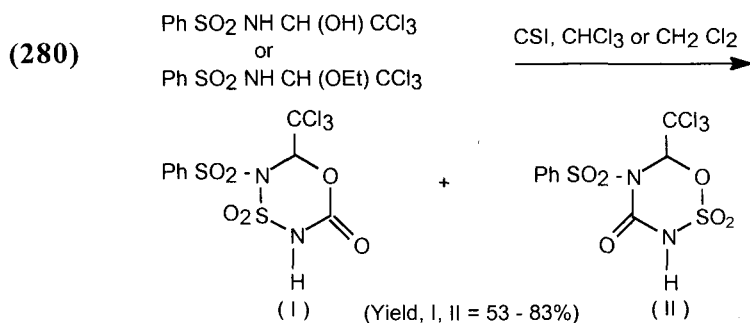
Fiandor, J., Garcia - Lopez, M-T., De Las Heras, F.G., Mendez - Castrillon, P.P., Felix, A.S., Alarcon, B., Carrasco, L., *Eur. J. Med. Chem.*, **22**, 59 (1987).



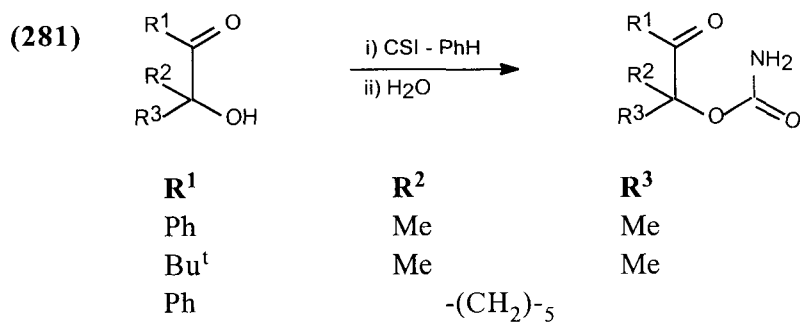
Elloumi, N., Moreau, B., Anguiar, L., Laziri, N., Sauvage, M., Hulen, C., Capmau, M.L., *Eur. J. Med. Chem.*, 149 (1992).



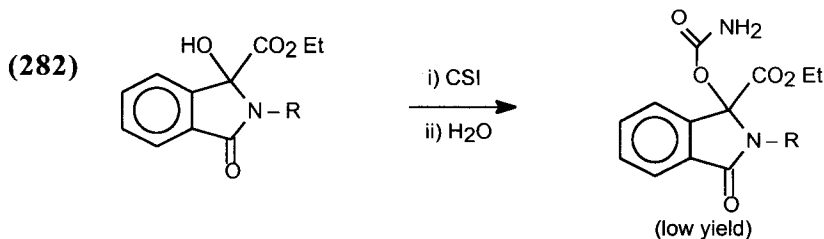
Olah, G.A., Vankar, Y.D., Arvanaghi, M., *Synthesis*, (2), 141 (1980).



Bryuzgin; A.A., Levkovskaya, G.G., Mirskova, A.N., *Zh. Org. Khim.*, **30** (I), 63 (1994), C.A. **122**, 10005^g (1995).

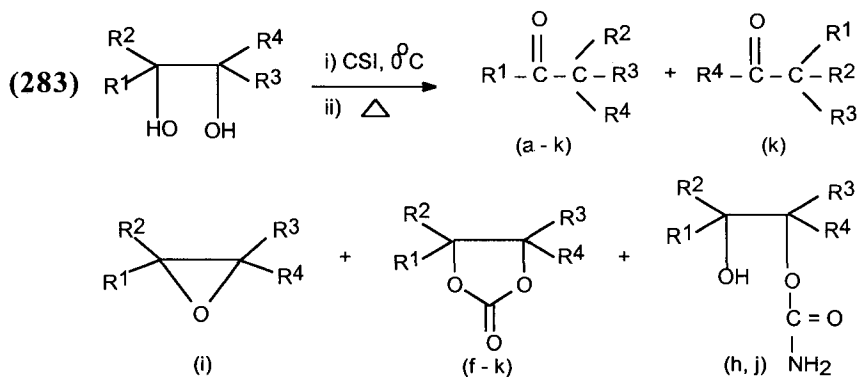


Graf, R., *Chem. Ber.*, **96**, 56 (1963).



Wrobel, J., Dietrich, A., *Heterocycles*, **38**, 1823 (1994).

Vic. Diols

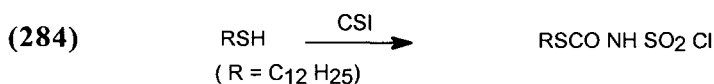


- a) R¹, R², R³, R⁴ = Ph
 b) R¹, R², R³, R⁴ = 4-MeC₆H₄.
 c) R¹, R², R³, R⁴ = 4-C₆H₅C₆H₄.
 d) R¹, R⁴ = Me; R², R³, = Ph
 e) R¹, R⁴ = Ph; R², R³, = 1-naphthyl.
 f) R¹, R²; R³, R⁴ = -(CH₂)₅⁻
 g) R¹, R²; R³, R⁴ = -(CH₂)₄⁻

- h) $R^2, R^4 = H; R^1, R^3 = -(CH_2)_4^-$
 i) $R^1, R^4 = H; R^2, R^3 = -(CH_2)_4^-$
 j) $R^2, R^4 = H; R^1, R^3 = Ph.$
 k) $R^1, R^2 = Me; R^3, R^4 = -(CH_2)_5^-$

Joseph., S.P., Dhar, D.N., *Synth. Comm.*, **18**, 2295 (1988).

Thioalcohols

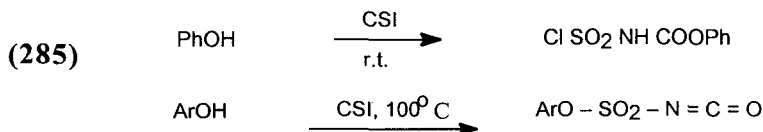


Graf, R., (Farbwerke Hoechst A.G.), German Patent 931, 467, 1952; *Chem. Zbl.*, 11094 (1954).

Graf, R., *Chem. Ber.*, **96**, 56 (1963).

Sheers, E.H., US Patent 3, 113, 857 (1963)., C.A. **60**, 5395^b (1964).

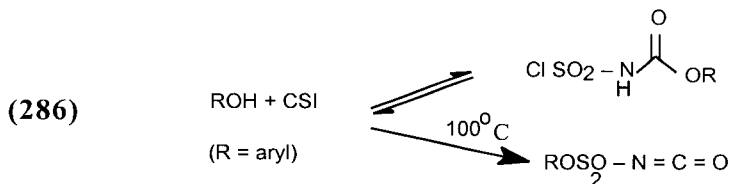
Phenols



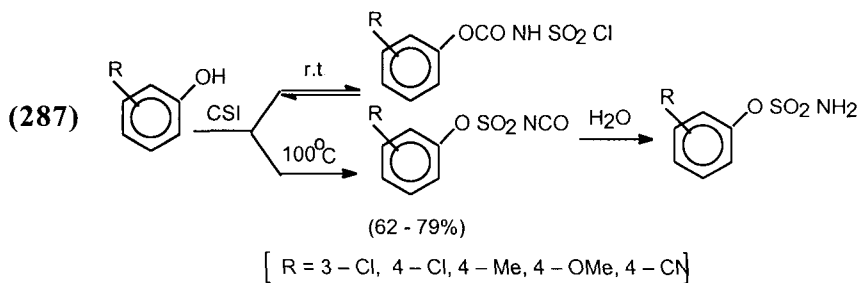
Lohaus, G., (Farbweke Hoechst A.G.), DAS 1230017, (1965).

Rasmussen, J.K., Hassner, A., *Chem. Revs.*, **76**, 389 (1976).

Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 389 (1976).

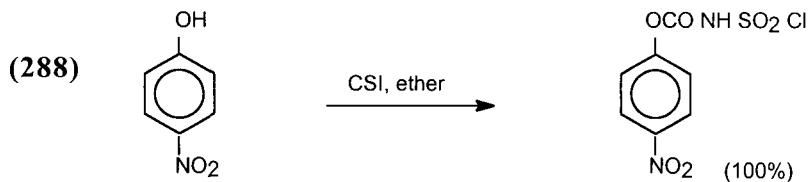


Warm, A., Bernardinelli, G., *JOC*, **59**, 3540 (1994).

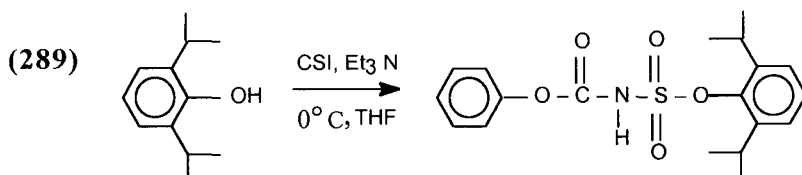


Hedayatullah, M., Hugueny, J.C., *Phosphorus and Sulfur*, **19**, 167 (1984).

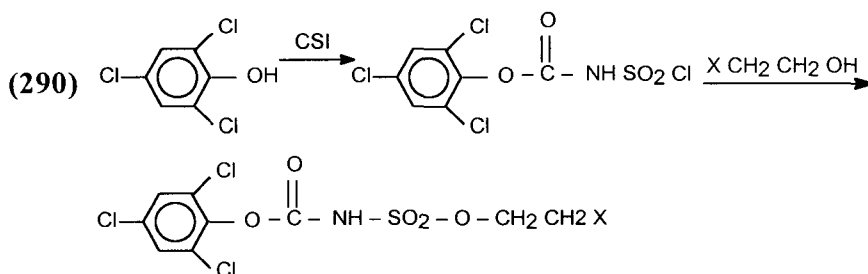
Lohaus, G., *Chem. Ber.*, **105**, 2791 (1972).



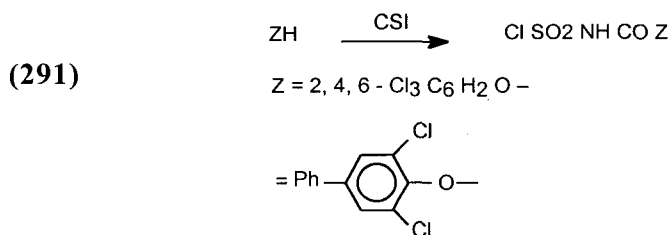
Barret, A.G.M, Betts., M.J., Fenwick, A., *JOC*, **50**, 169 (1985).



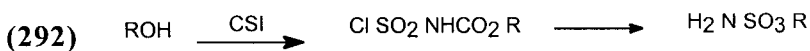
Sliskovic, D.R., Krause, B.R., Picard, J.A., Andreson, M., Bousley, R.F., Homelehle, K.L., Homan, R., Julian, T.N., Rashidbaigi, Z.A., Stanfield, R.L., *J. Med. Chem.*, **37**, 560 (1994).



Montero, J.L., Dewynter, G., Agoh, B., Delaunay, B., Imbach, J.-L. *Tet. Lett.*, **24**, 3091 (1983).

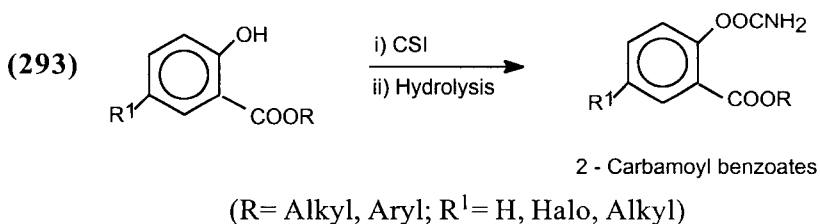


Lattrell, R., Lohaus, G., *Chem. Ber.*, **105**, 2800 (1972).

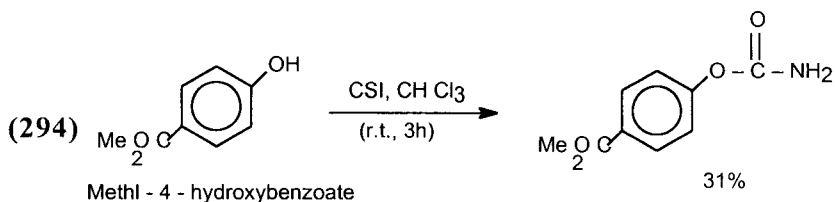


R = Pentachlorophenyl,
 = Pentabromophenyl,
 = 2, 4, 6- tri-iodophenyl.

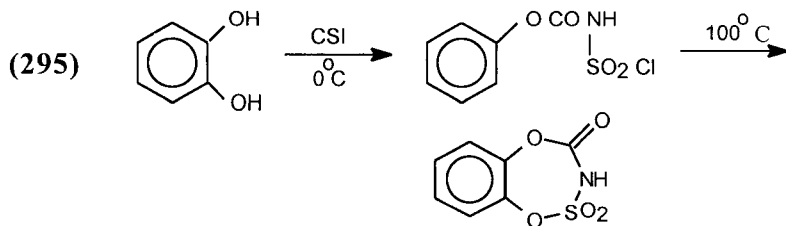
Hedayatullah, M., Brault, J.F., *CR herbd. Seances Acad. Sci., Ser. C.*,
285, 153 (1977).



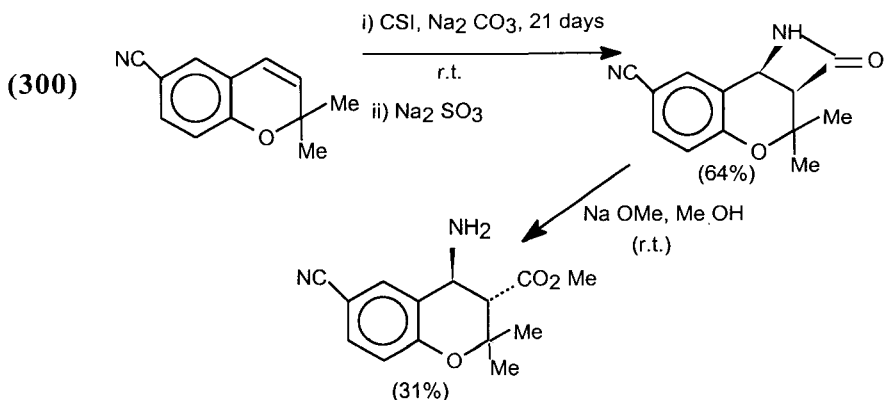
Kamal, A., Rao, M.V., Diwan, P.V., Rao, A.B., Sattur, P.B., *Eur. J. Med. Chem.*, **23**, 487 (1988).



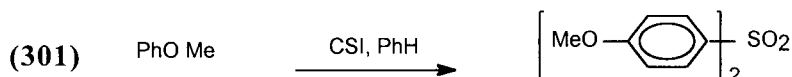
Parameswaran, K.N., Shi, G-Y., Klotz, I.M., *J. Med. Chem.*, **30**, 936 (1987).



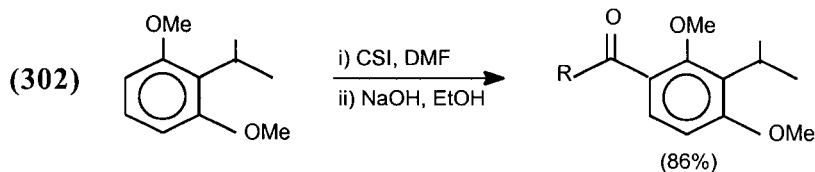
Hedayatullah, M., Brault, J.F., *Phosphorus and Sulfur*, **11**, 255 (1981).



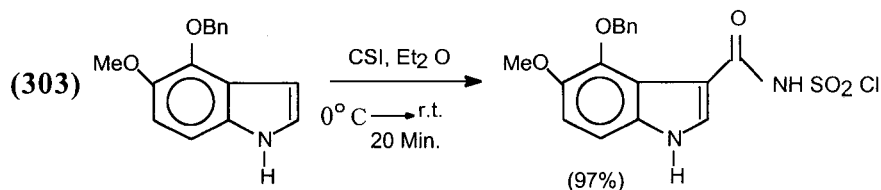
Buckle, D.R., Houge - Frydrych, C.S.V., Pinto, I.L., Smith, D.G., *JCS Perkin Trans. I*, 63 (1991).



Effenberger, F., Gleiter, R., Heider, L., Niess, R., *Chem. Ber.*, **101**, 502 (1968).

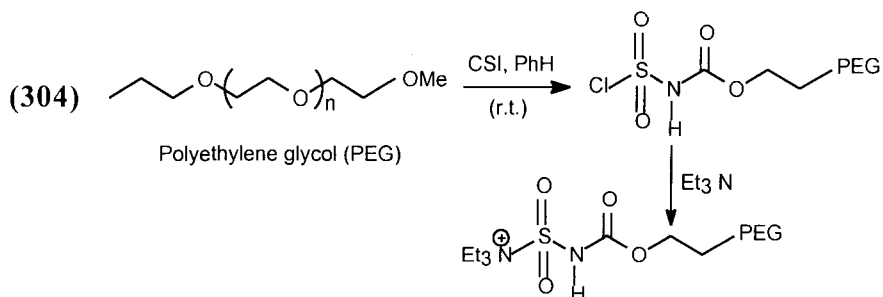


Iio, H., Zenfuku, K., Tokoroyama, T., *Tet., Lett.*, **36**, 5921 (1995).

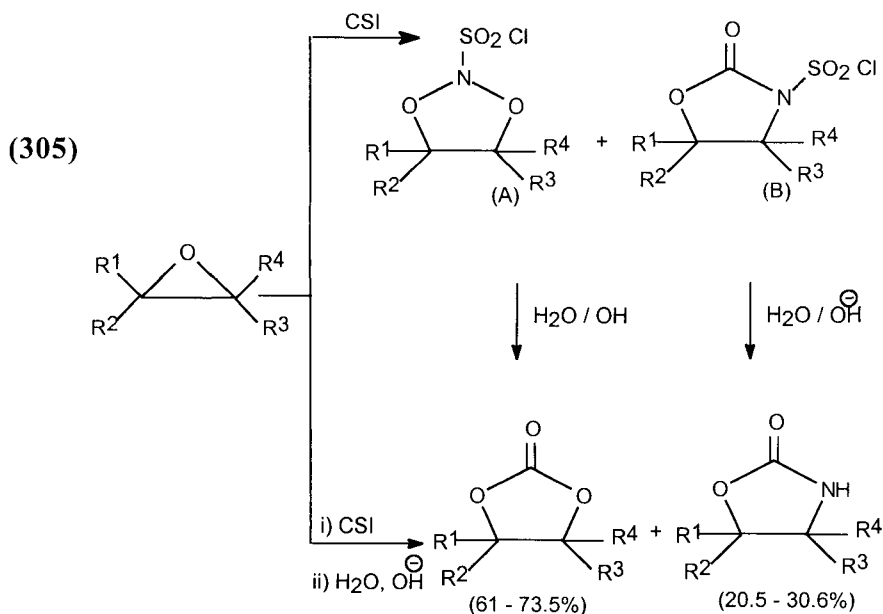


Moody, C.J. Swann, E., *JCS Perkin Trans., I*, (21), 2561 (1993).

Moody, C.J. Swann, E., *Tet. Lett.*, **34**, 1987 (1993).



Wipf, P., Venkataraman, S., *Tet. Lett.*, **37**, 4659 (1996).



a) R¹, R³ = Ph

R², R⁴ = H

b) R¹, R⁴ = H

R², R³ = Ph

c) R¹, R⁴ = H

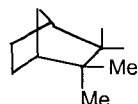
R², R³ = $(\text{CH}_2)_6$

d) R¹, R², R³ = H

R⁴ = Ph

e) R¹ = COPh

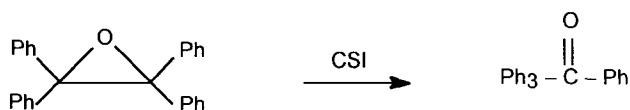
R², R⁴ = H; R³ = Ph

f) R¹, R² = 

R³, R⁴ = H

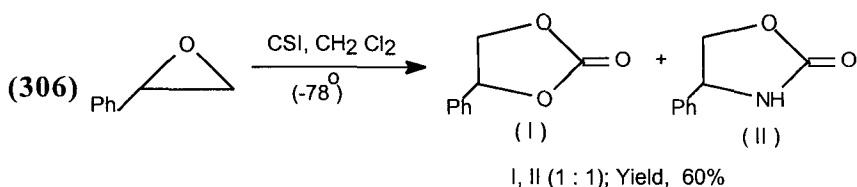
Table : 1.3 - Dioxolan - 2-ones(A) and 1,3- Oxazolidin-2-ones (B)

Epoxide	Yield, %	
	A	B
<i>Trans</i> - Stilbene Oxide	73	23
<i>Cis</i> - Stilbene Oxide	61	23
<i>Cis</i> - Cyclo-octene Oxide	74	20
Styrene Oxide	61	30
Chalcone epoxide	67	28

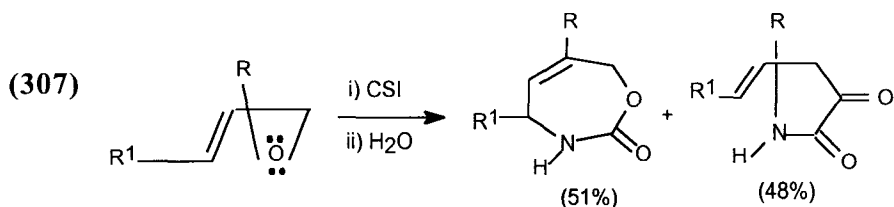


Keshava Murthy, K.S., Dhar, D.N., *Synth. Comm.*, **14**, 687 (1984).

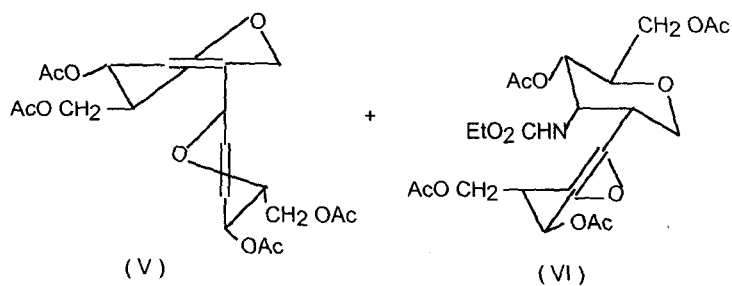
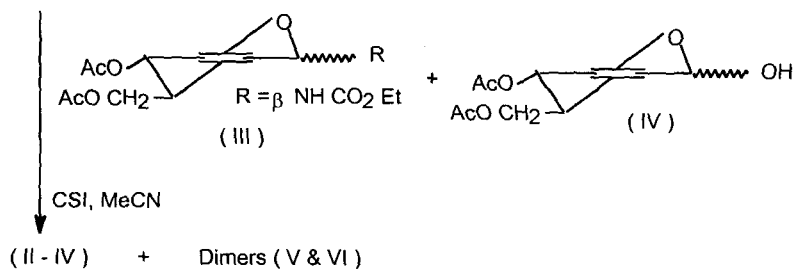
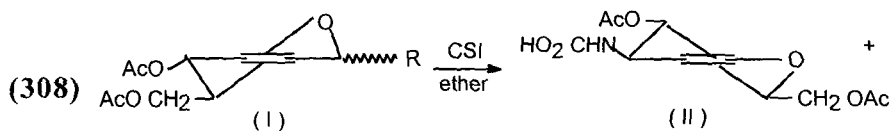
Keshava Murthy, K.S., Dhar, D.N., *J. Heterocycl. Chem.*, **21**, 1721 (1984).



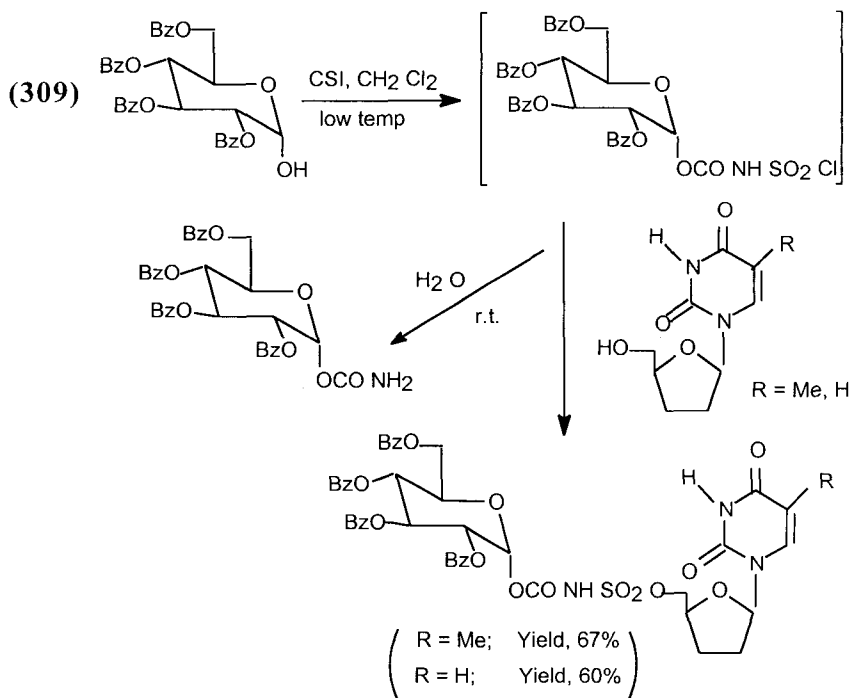
Lorincz, T., Erden, I., *Synth. Comm.* **16**, 123 (1986).



Daniel, J., Shukla, D., Dhar, D.N., *Chem. Lett.*, 1575 (1992).

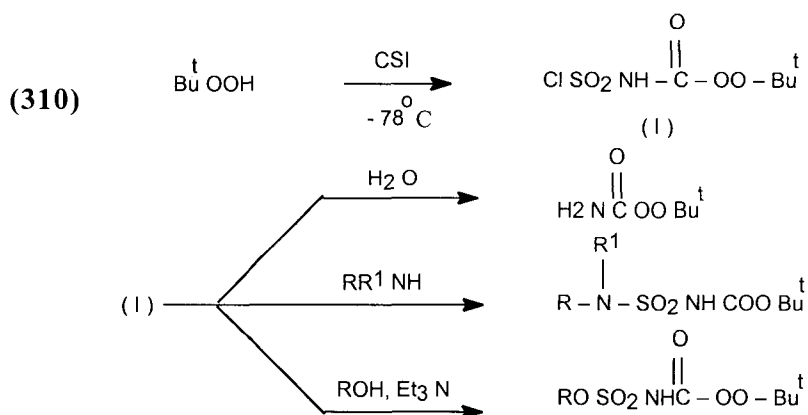


Hall, R.H., Jordaan, A., De Villiers, O.G., *JCS Perkin Trans. I*, 626 (1975).

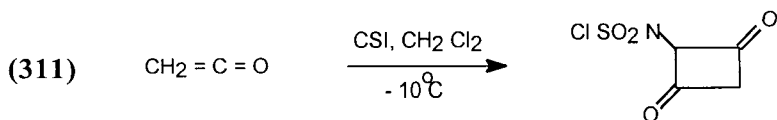


Pere'z- Pere'z, M-J., Bal zarini, J., De Clercq, E., Camarasa, M-J., *Biorg. & Med. Chem.*, **1**, 279 (1993).

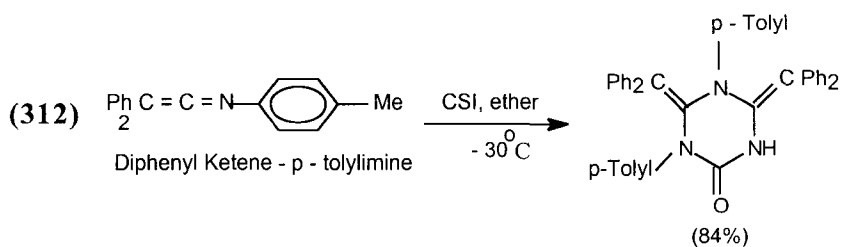
Peroxide



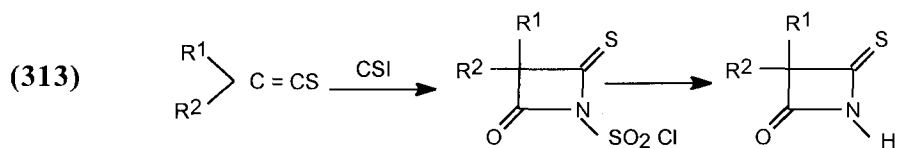
Hoft, E., Ganschow, S., *J. Prakt. Chem.*, **316**, 359 (1974).

Ketenes

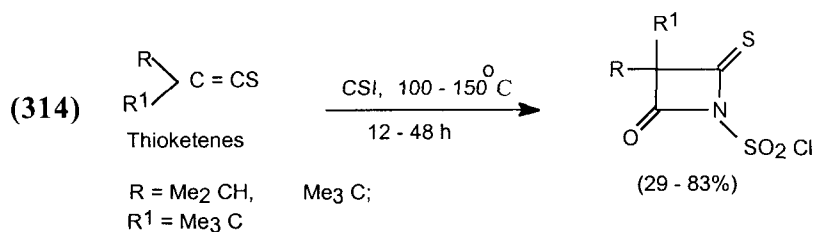
Mundloss, E., Graf, R., *Ann.*, **677**, 108 (1964).



Romming, C., Skatteboel, L., *Acta Chem. Scand.*, **43**, 819 (1989).

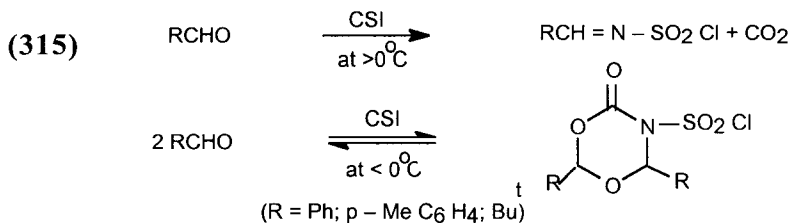
Thioketenes

Schaumann, E., Möller, M., Adiwidjaja, G., *Chem. Ber.*, **121**, 689 (1988).



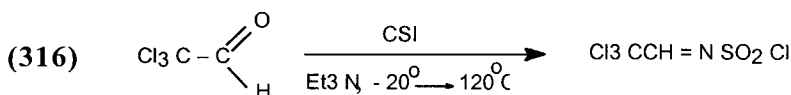
Schaumann, E., Roehr, A., Adiwidjaja, G., *Tet. Lett.*, **21**, 4247 (1980).

Aldehydes

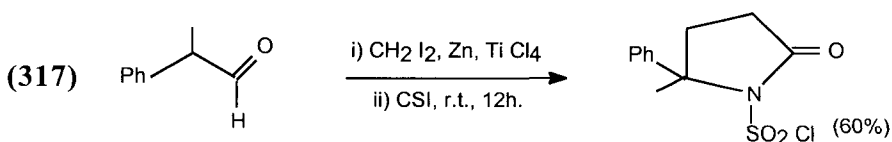


Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).

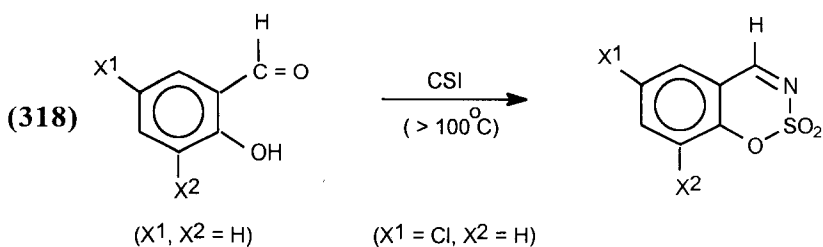
Clauss, K., Friedrich, H.J. Jensen, H., *Ann.*, 561 (1974).



Schmidt, E., Kuehlein, K., *Ger. Offen.* **2**, 645, 280., *C.A.* **89**, 5908 (1978).

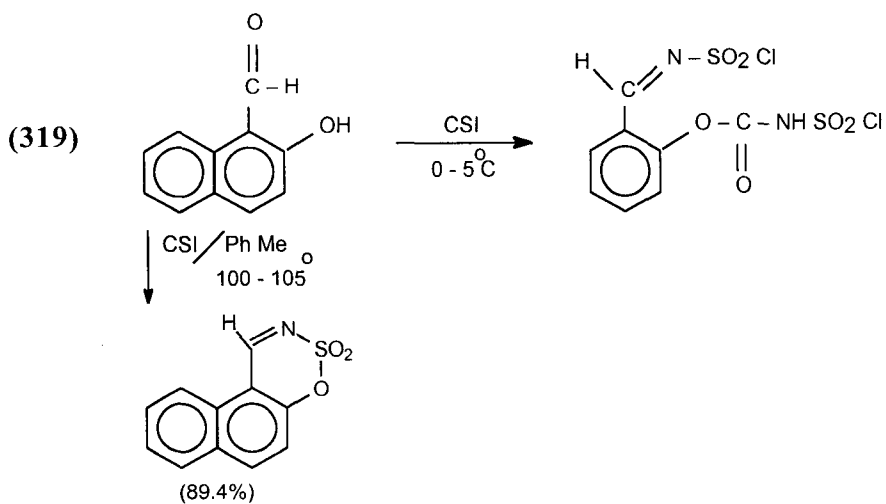


Black, H.T., Olson, J.T., Abt, C.D., *Synth. Comm.*, **22**, 2729 (1992).

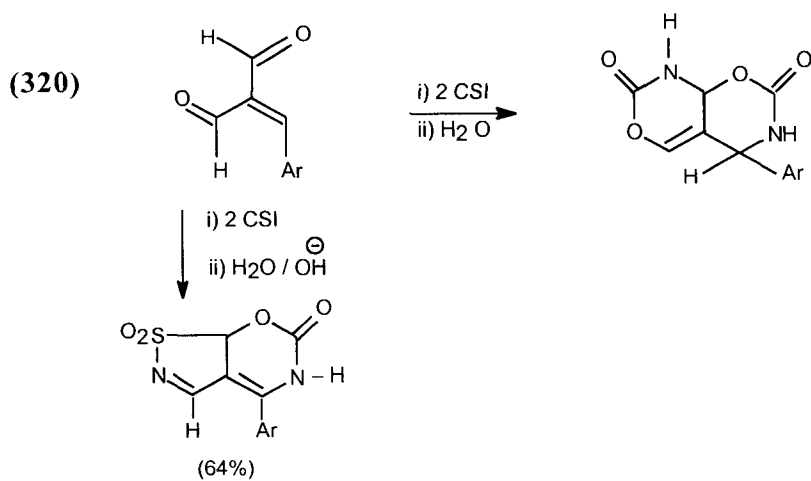


Kamal, A. and Sattur, P.B., *Synthesis*, 272 (1981); *Synth. Comm.*, **12**, 157 (1982).

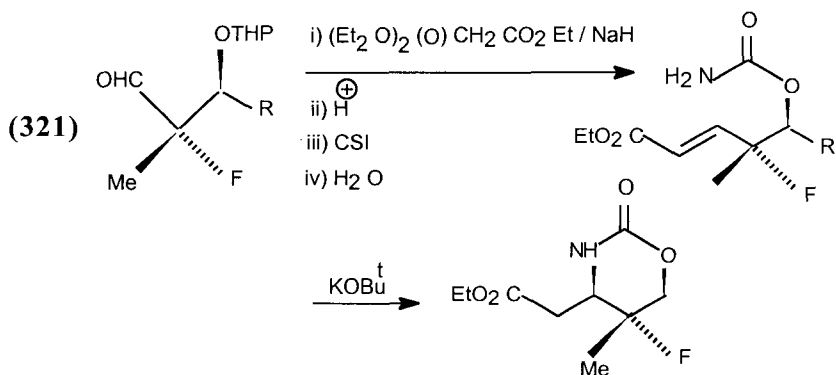
Dhar, D.N., Bag, A.K., *Ind. J. Chem.*, **22B**, 627 (1983).



Dhar, D.N. Bag, A.K., *Ind. J. Chem.*, **22B**, 627 (1983).

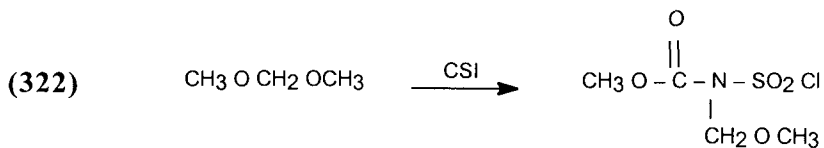


Daniel, J., Dhar, D.N., *Tetrahedron*, **48**, 4551 (1992).

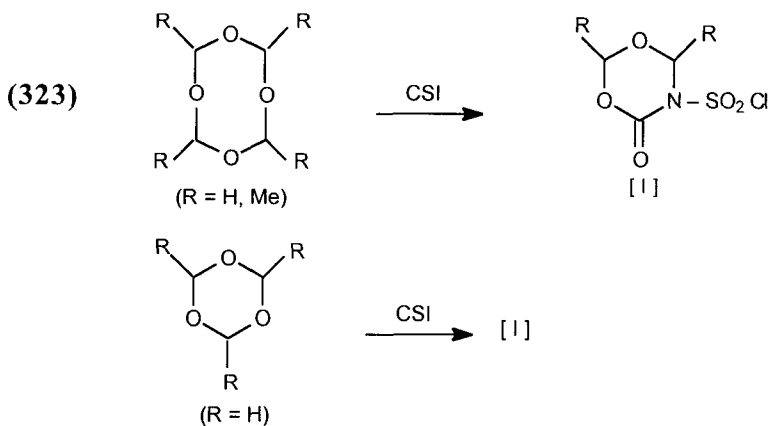


Kitazume, T., Kobayashi, T., Yamamoto, T., Yamazaki, T., *JOC*, **52**, 3218 (1987).

Acetals



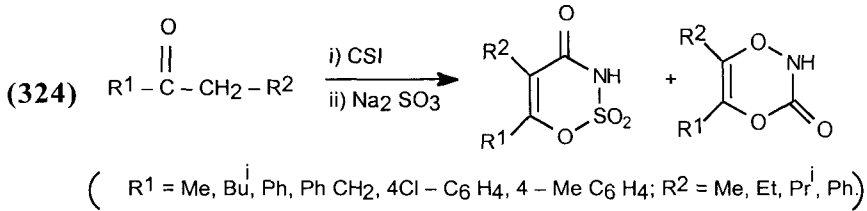
Clauss, K., Friedrich, H.J., Jensen, H., *Ann.*, 561 (1974).



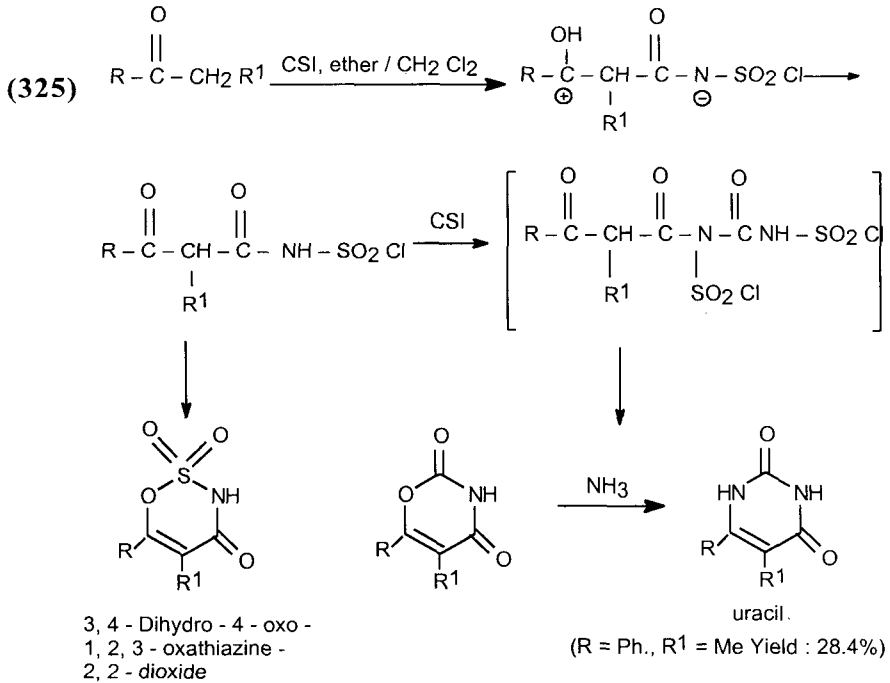
Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).

Clauss, K., Friedrich, H.J., Jensen, H., *Ann.*, 561 (1974)

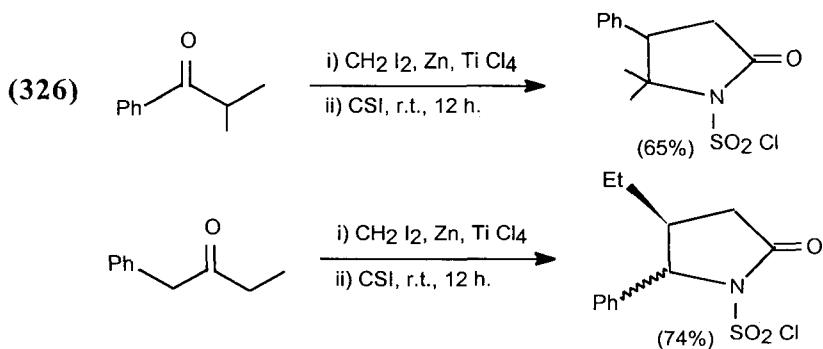
Ketones



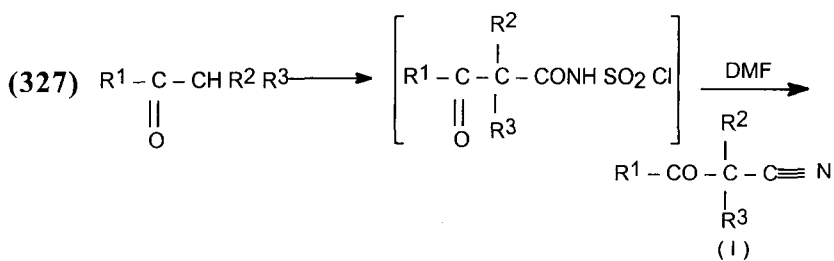
Hassner, A., Rasmussen, J.K., *JACS*, **97**, 1451 (1975).



Rasmussen, J.K., Hassner, A., *JOC*, **38**, 2114 (1973).



Black, H.T., Olson, J.T., Abt, C.D., *Synth. Comm.*, **22**, 2729 (1992).

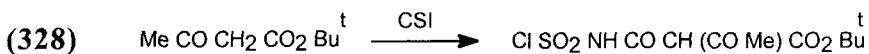


R^1	R^2	R^3	% yield(I)
Ph	Me	H	90
Ph	Et	H	82
Ph	Me	Me	80
Et	Me	H	71
Me	Me	Me	87
Me	Me	H	63
Me	COMe	H	70
	$-(\text{CH}_2)_3-$	H	54
	$-(\text{CH}_2)_4-$	H	69

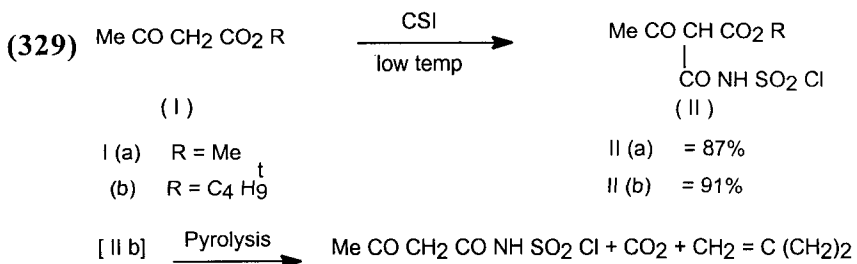
Clauss, K., Friedrich, H.J. Jensen, H., *Ann.*, 561 (1974).

Rasmussen, J.K., Hassner, A., *JOC*, **38**, 2114 (1973).

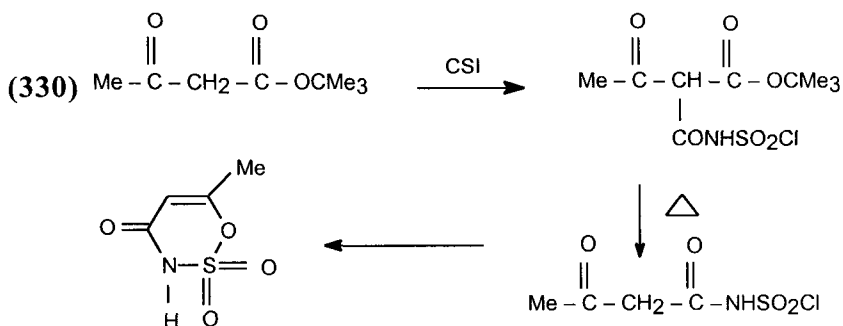
Rasmussen, J.K. Hassner, A., *Synthesis*, 682 (1973).



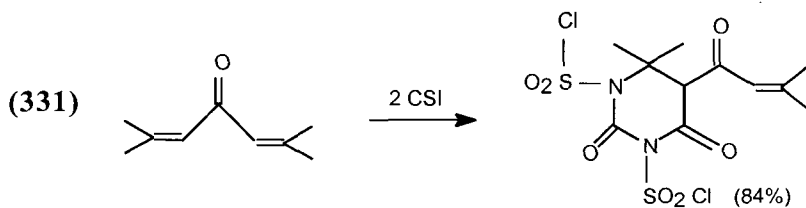
Yarmenko, V.V., Drach, B.S., Drogovoz, G.K., Nagurnaya, N.A. Babin, N.A., Kalita, E.V., Berezina, V.F., Sergeev, S.A. Chichetkin, V.I., Pripulina, L.S., Russian patent, RU 2035457 C.A. **124**, 146207 (1996).



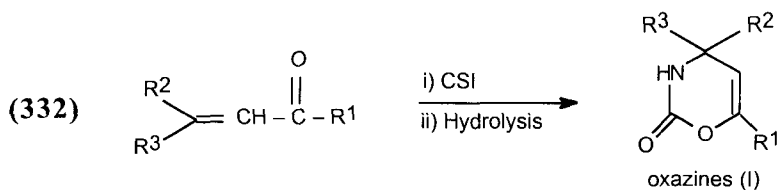
Clauss, K., Friedrich, H.J., Jensen, H., *Ann.* 561 (1974).



(Hoechst, A.G.), German Patent, 2, 327, 804 C.A. **82**, 171097 (1975).

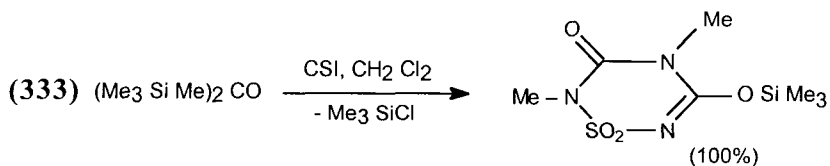


Clauss, K. Friedrich, H.J., Jensen, H., *Ann.*, 561 (1974).

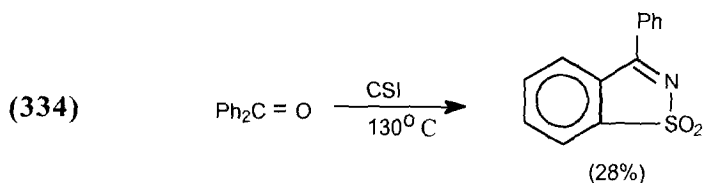


R^1	R^2	R^3	%yield(I)
Me	Me	Me	54
Ph	Me	Me	39
Ph	H	Ph	57
Me	H	p-MeOC ₆ H ₄	55
Ph	H	p-ClC ₆ H ₄	45
CMe ₃	H	Ph	54
PhCH=CH	H	Ph	44

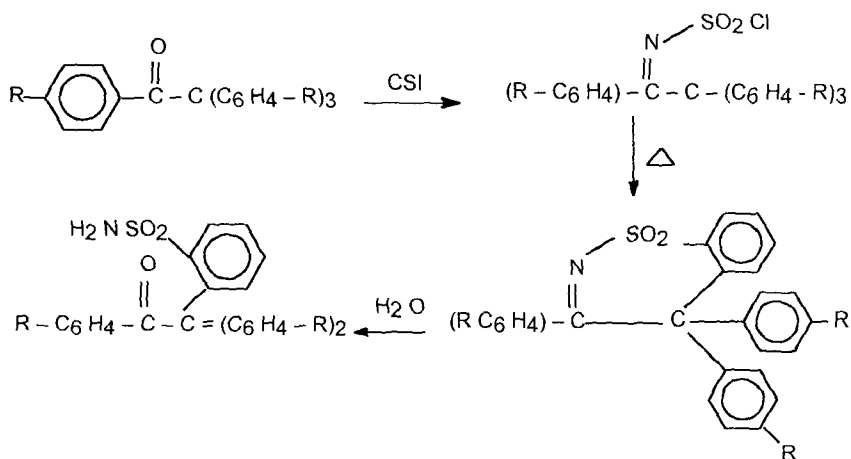
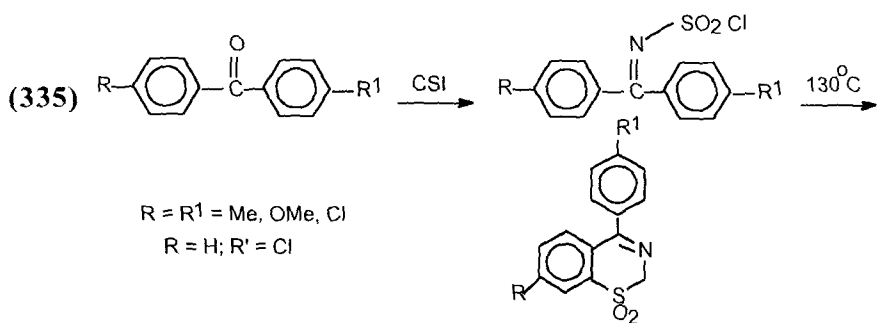
Clauss, K., Friedrich, H.J., Jensen, H. *Ann.*, 561 (1974).



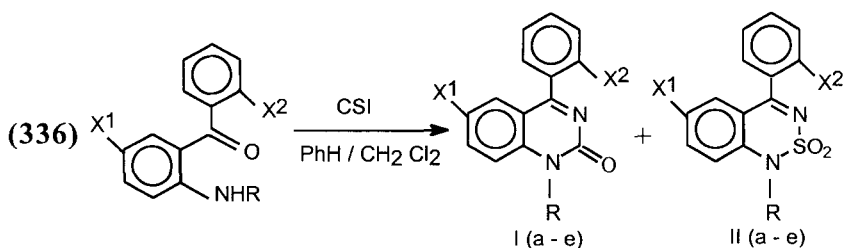
Barton, T.J., Rogido, R.J., *JCS Chem. Comm.*, 878 (1972).



Clauss, K., Friedrich, H.J., Jensen, H., *Ann.*, 561 (1974).

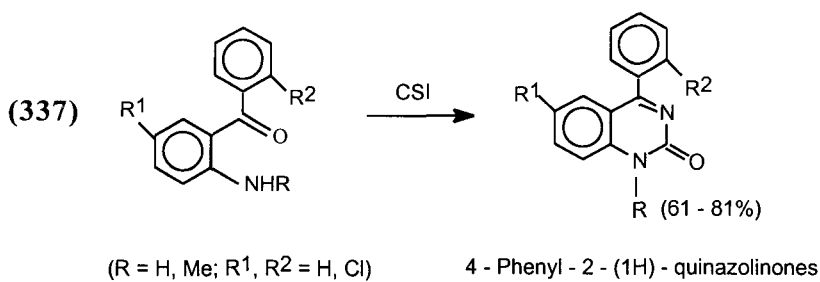


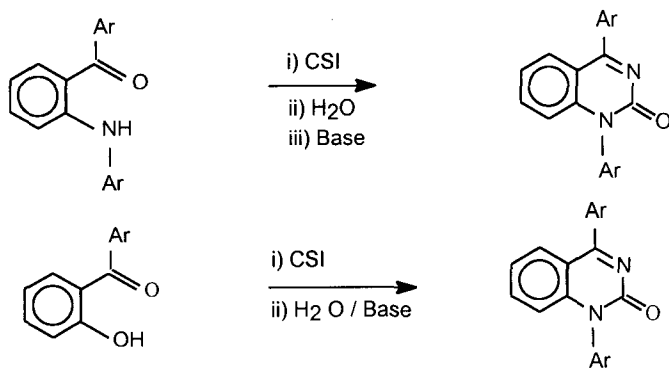
Joseph, S.P., Keshava Murthy, K.S., Dhar, D.N. *Synth. Comm.*, 19, 417 (1989).



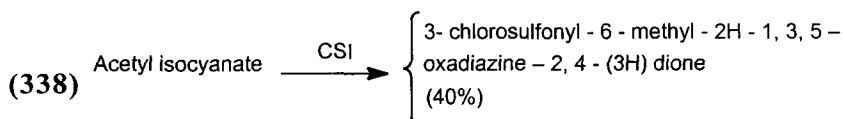
Compd. No.	R	X ¹	X ²	Yield, %	
				I	II
a	H	H	}	66	8
b	H	Cl		72	6
c	H	Cl		70	7
d	Me	H	H	78	5
e	Me	Cl	H	81	5

Kamal, A., Rao, K.R., Sattur, P.B., *Synth. Comm.*, **10**, 799 (1980).

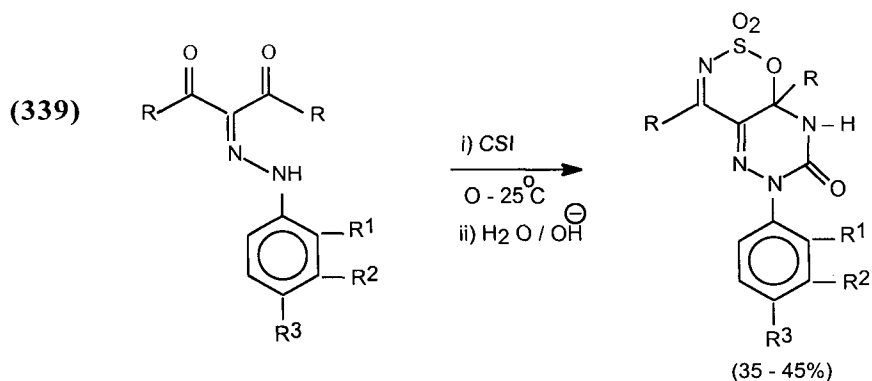


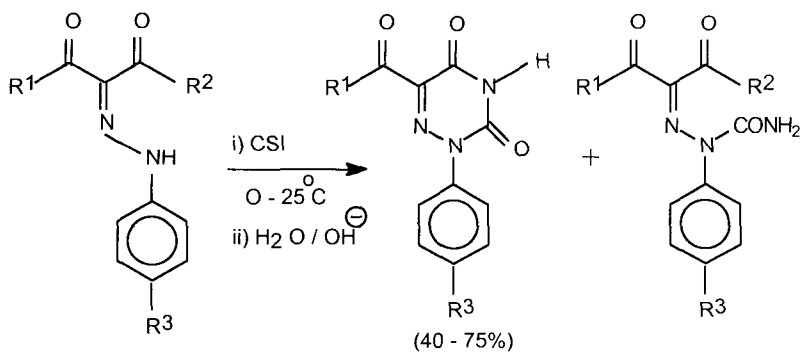


Kamal, A., Rao, K.R., Sattur, P.B., *Synth. Comm.*, **10**, 799 (1980) *Synth. Comm.*, **12**, 157 (1982).



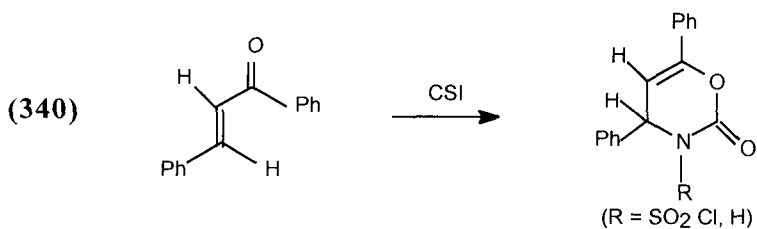
Sridhara, N.S., Latscha, P., *Z. Naturforsch.*, **30(B)**, 969 (1975).



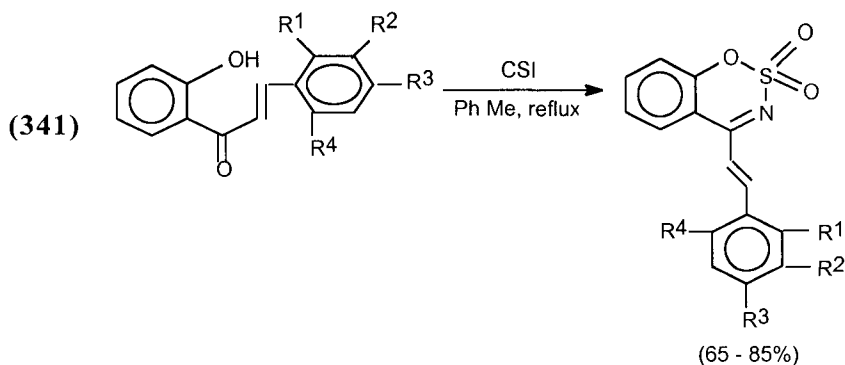


- a) $R^1 = Ph; R^2 = Me; R^3 = Cl$
 b) $R^1 = Ph; R^2 = Me; R^3 = H$
 c) $R^1, R^2 = Ph; R^3 = Cl$

Daniel, J., Dhar, D.N., *Synth. Comm.*, **21**, 1695 (1991).

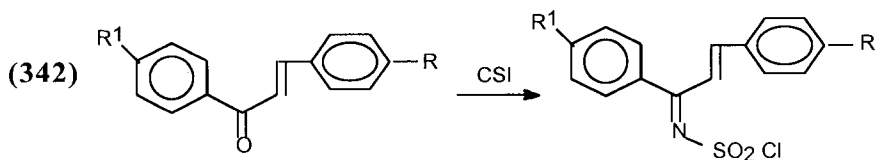


Dhar, D.N., Mehta, G., Suri, S.C., *Ind. J. Chem.*, **14B**, 477 (1976).



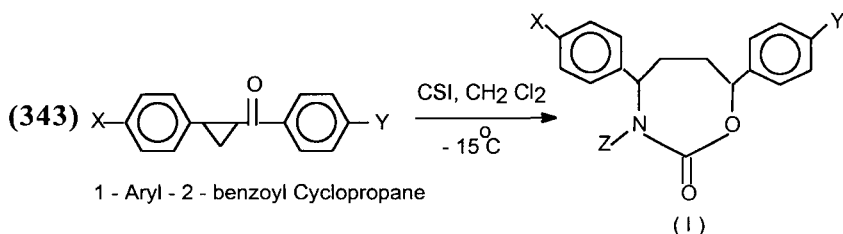
- a) $R^1, R^2, R^3, R^4 = H$;
 b) $R^1, R^2, R^4 = H; R^3 = Cl$
 c) $R^2, R^3 = H; R^1, R^4 = Cl$;
 d) $R^1, R^2, R^4 = H; R^3 = OMe$
 E) $R^1, R^4 = H; R^2, R^3 = OMe$

Dhar, D.N. Bag, A.K. *Ind. J. Chem.*, **22B**, 627 (1983).



- a) $R = OMe;$ $R^1 = H$
 b) $R = H;$ $R^1 = OMe$
 c) $R = Me;$ $R^1 = H$
 d) $R = Cl;$ $R^1 = OMe$

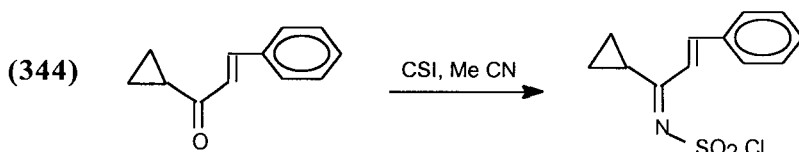
Dhar, D.N., Suri, S.C., *Ind J. Chem.*, **18B**, 281 (1979).



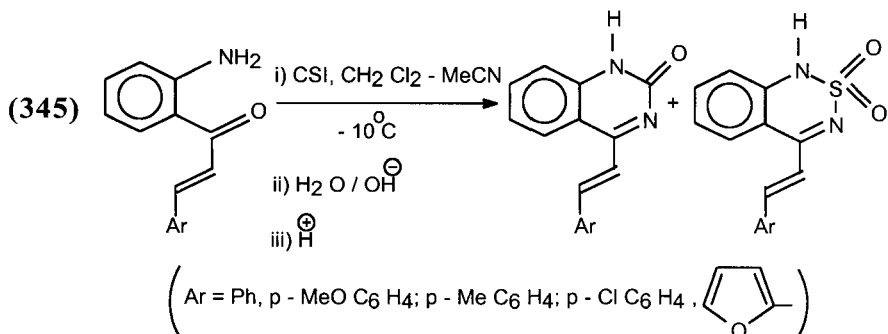
- a) X, Y = H
- b) X = OMe; Y = H
- c) X = OEt; Y = H
- d) X = Me; Y = H
- e) X = OMe; Y = Cl
- f) X, Y = OMe
- g) X = Cl; Y = H

Z = SO₂ Cl; Yield (I) = 50-68%
 = H; Yield (I) = 20-53%

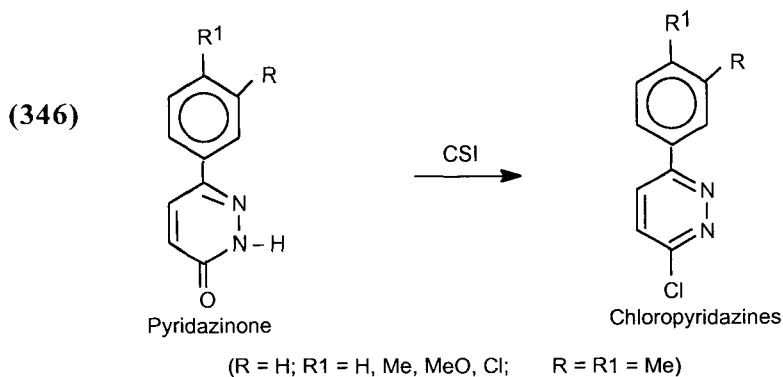
Sampath Kumar, E., Dhar, D.N., *Synth. Comm.*, **25**, 1939 (1995).



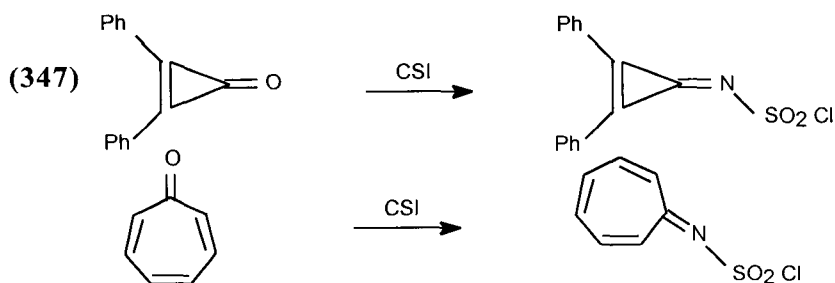
Sampath Kumar, E., Dhar, D.N., *Ind. J. Chem.*, **34B**, 63 (1995).



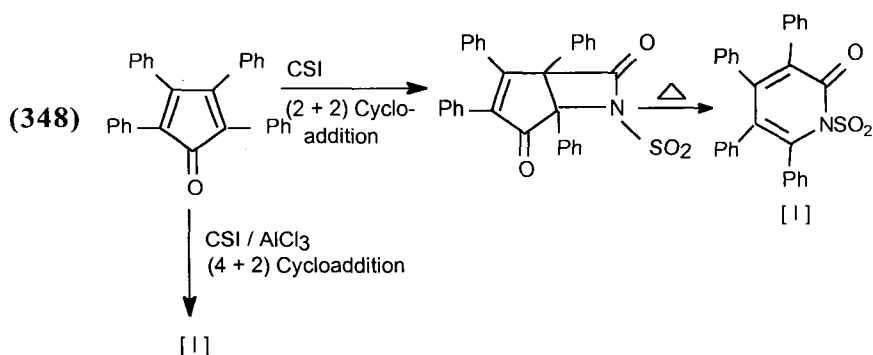
Pramod Kumar, Dhar, D.N., *Synth. Comm.*, **25**, 1933 (1995).



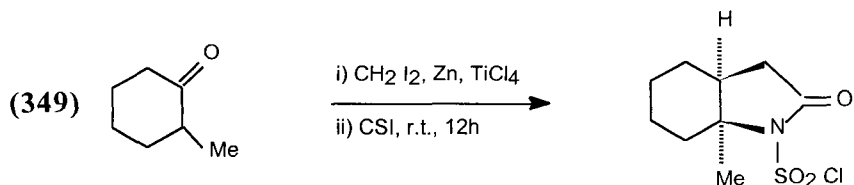
Srinivasan, T.N., Rao, K.R., Sattur, P.B., *Synth. Comm.*, **16**, 543 (1986).



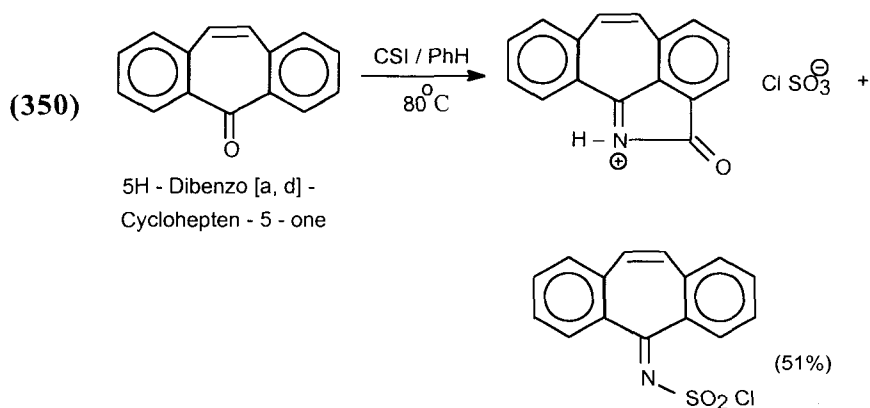
Moriconi, E.J., "Mechanisms of Reactions of Sulfur Compounds", Vol.3, Intra - Science Foundation, Santa Monica, Calif. p. 131 (1968).



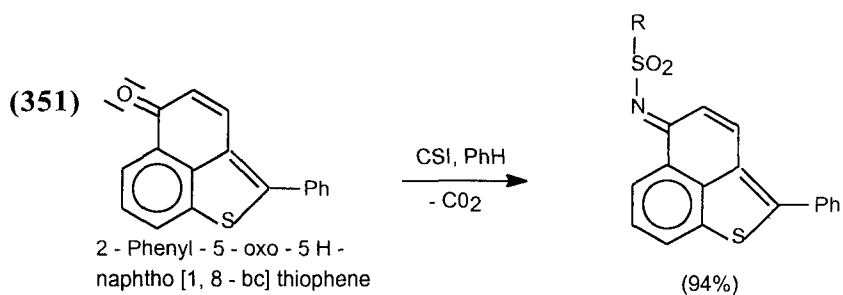
Kumar, P.R., Selvi, T.K., *Ind. J. Chem.*, **23B**, 1046 (1984).



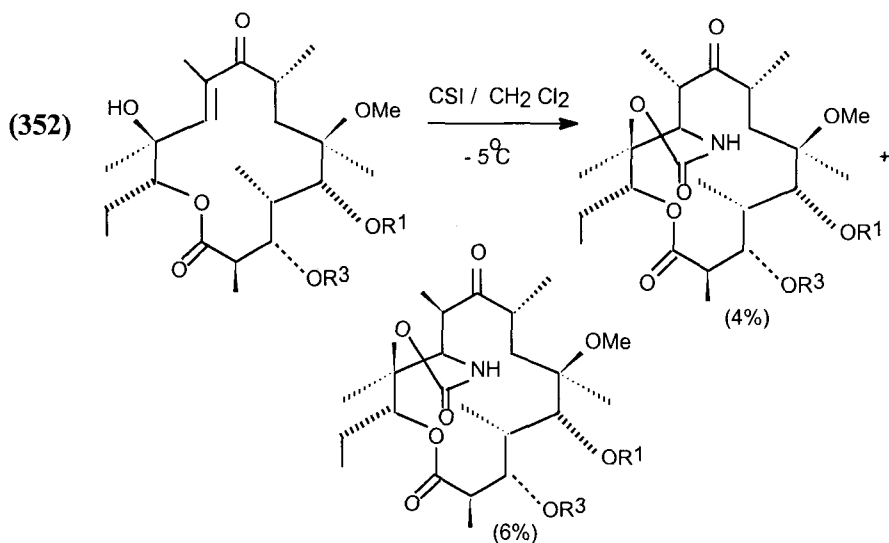
Black, H.T., Olson, J.T. Abt, C.D., *Synth. Comm.*, **22**, 2729 (1992).



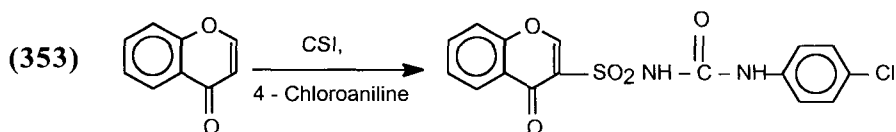
Rokach, J., Girard, Y., Atkinson, J.G., *JCS Chem. Comm.*, 892 (1979).



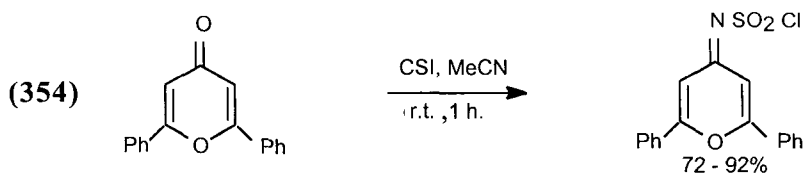
Neidlein, R., Kraemer, A.D., *Tet. Lett.*, **17**, 4713 (1976).



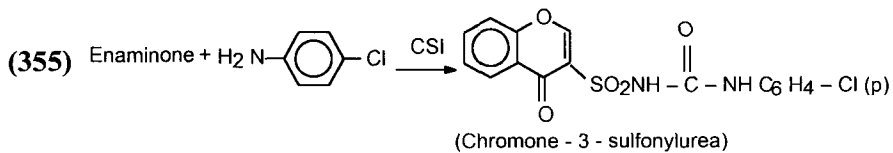
Baker, W.R., Clark, J.D., Stephens, R.L. Kim, K.H., *JOC*, **53**, 2340 (1988).



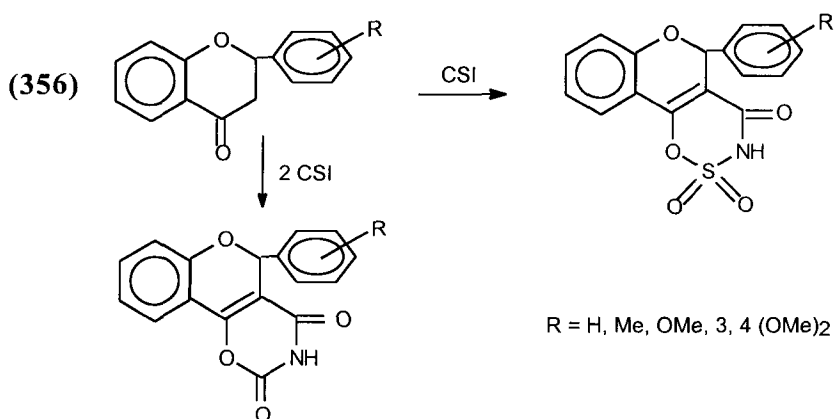
Loewe, W., Matzanke, N., Ruetjes, T., *Arch. Pharm. (Weinheim, Ger.)* **327**, 819 (1994).



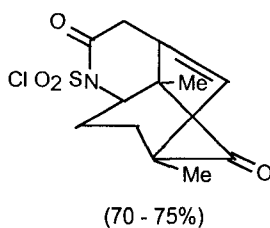
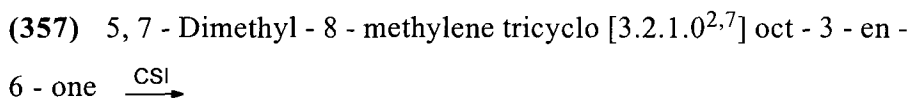
Van Allan, J.A., Chang, S.C., Reynold, G.A., *J. Heterocycl. Chem.*, **11**, 195 (1974).



Loewe, W., Metzanke, N., Ruetjes, T., *Arch. Pharm.*, **327**, 819 (1994).

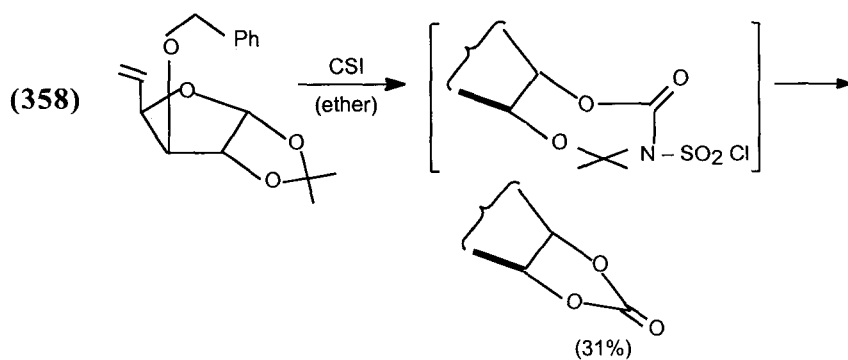


Tripathi, M., Dhar, D.N., *Ind. J. Chem.*, **26B**, 1082 (1987).

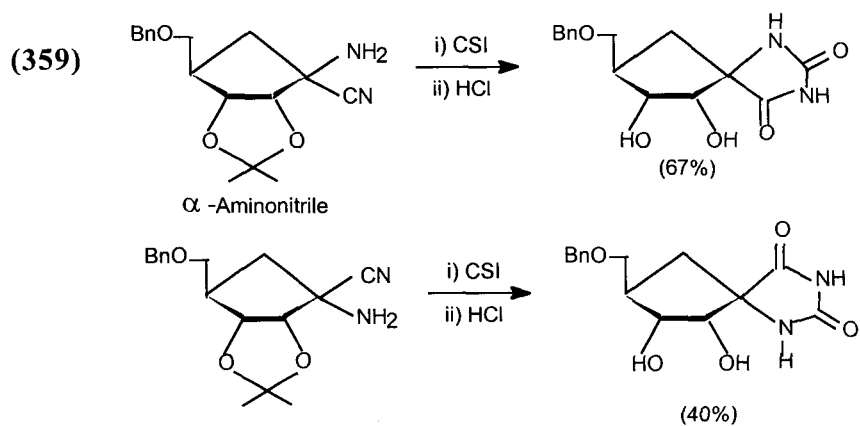


Fischli, A., Mayer, H., Oberhaensli, W., *Helv. Chim. Acta*, **57**, 57 (1974).

Ketals



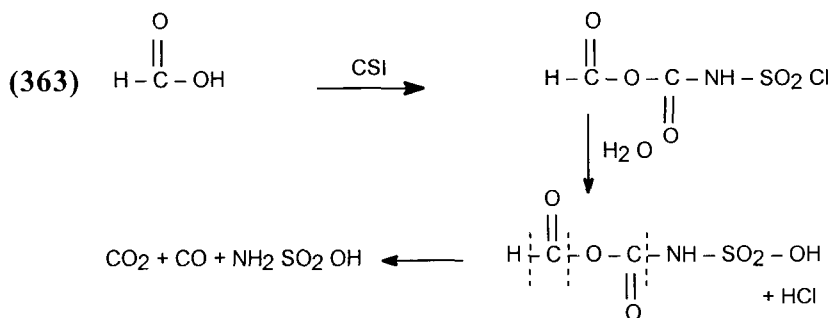
Hall, R.H., Jordaan, A., Lourens, G.J., *JCS Perkins Trans. I*, 38 (1973).



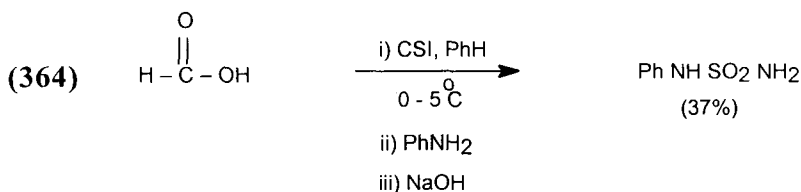
Sano, H., Sugai, S., *Tetrahedron*, **51**, 4635 (1995).

Sano, H., Sugai, S., *Tet. Asymm.*, **6**, 1143 (1995).

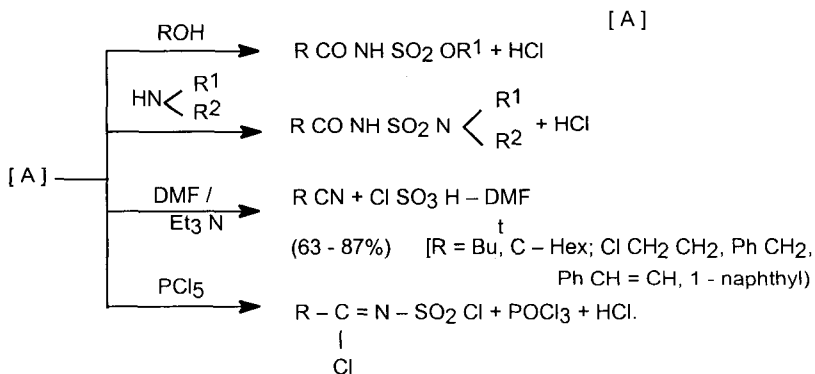
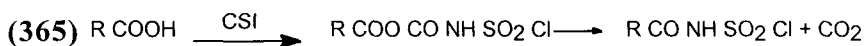
Acids



Graf. R., (Farbwerke Hoechst A.G.) German Patent, 931, 225, 1952., *Chem. Zbl.*, 3995 (1956).



Lee, C.H., Kohn, H., *JOC*, **55**, 6098 (1990).



Graf. R., (Farbwerke Hoechst A.G.), German Patent, 931, 225, 1952., *Chem. Zbl.*, 3995 (1956).

Graf. R., (Farbwerke Hoechst A.G.), German Patent, 940, 529, 1952.,
Chem. Zbl., 13257 (1956).

Lohaus, G., Graf. R., (Farbwerke Hoechst A.G.), German Patent, 1218448
A.G.), 1963.

Lohaus, G., *Chem. Ber.*, **100**, 2719 (1967).

Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).

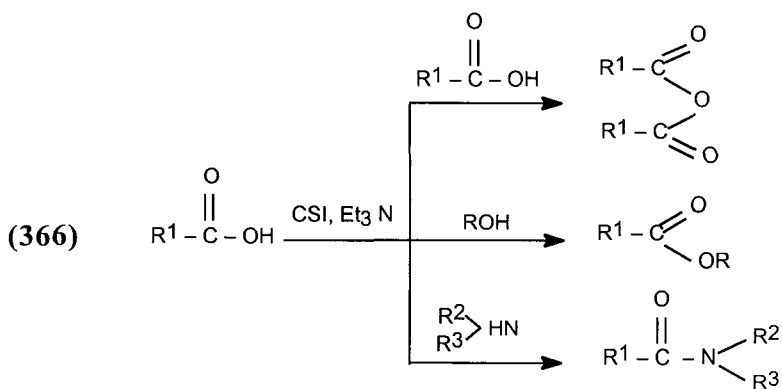
Moriconi, E.J., ``*Mechanism of Reactions of Sulfur Compounds*'', Vol.3,
Intra - Science Foundation, Santa Monica, Calif. p. 131 (1968).

Vorbrüggen, H., *Tet. Lett.*, **9**, 1631 (1968).

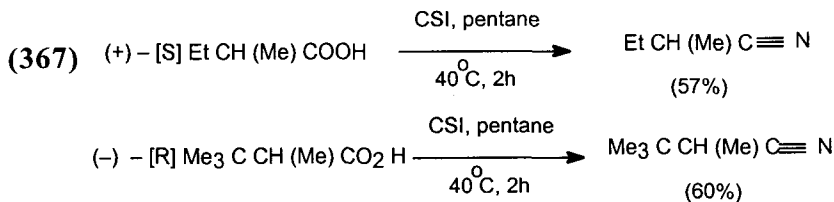
Botteghi, C., Chelucci, G., Marchetti, M., *Synth. Comm.*, **12**, 25 (1982).

Wittmann, H., Beutel, P., Ziegler, E., *Monatsh., Chem.*, **100**, 1624 (1969).

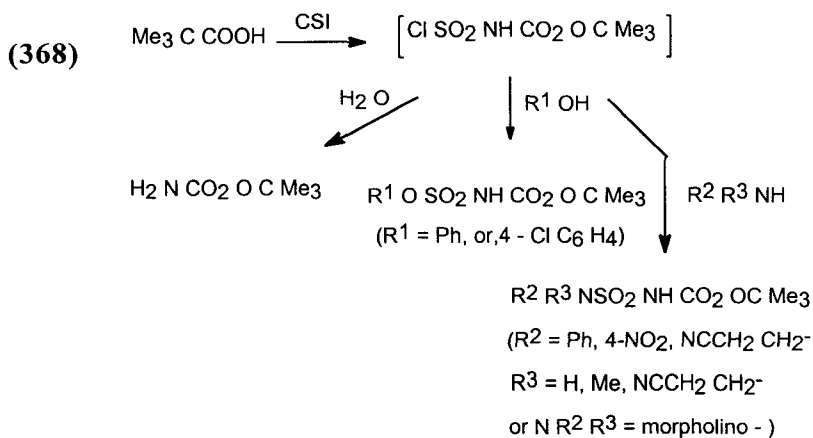
Vorbrüggen, H., Krolikiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



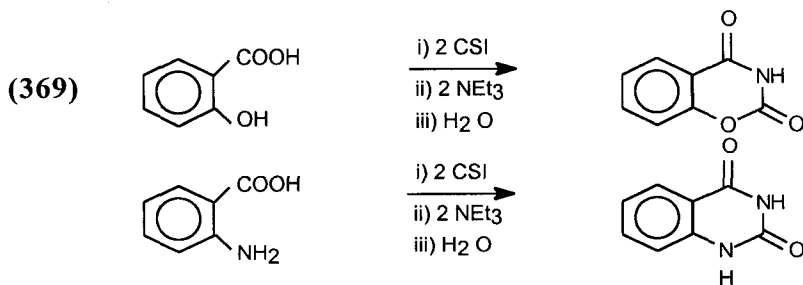
Keshava Murthy, K.S., Vankar, Y.D., Dhar, D.N., *Synthesis*, 506 (1982).



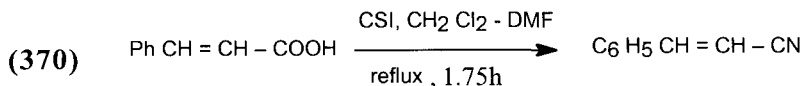
Botteghi, C., Chelucci, G., Marchetti, M., *Synth. Comm.*, **12**, 25 (1982).



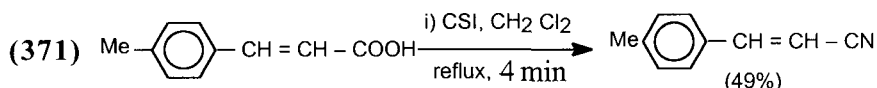
Hoft, E., Ganschow, S., *J. Prakt. Chem.*, **316**, 569 (1974).



Vorbrüggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



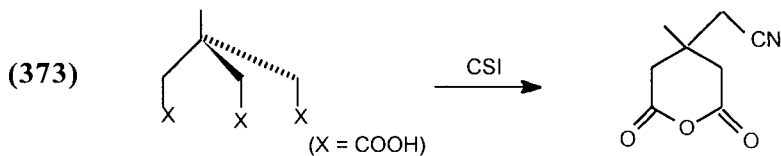
Lohaus, G., *Org. Synth.* **50**, 18 (1970).



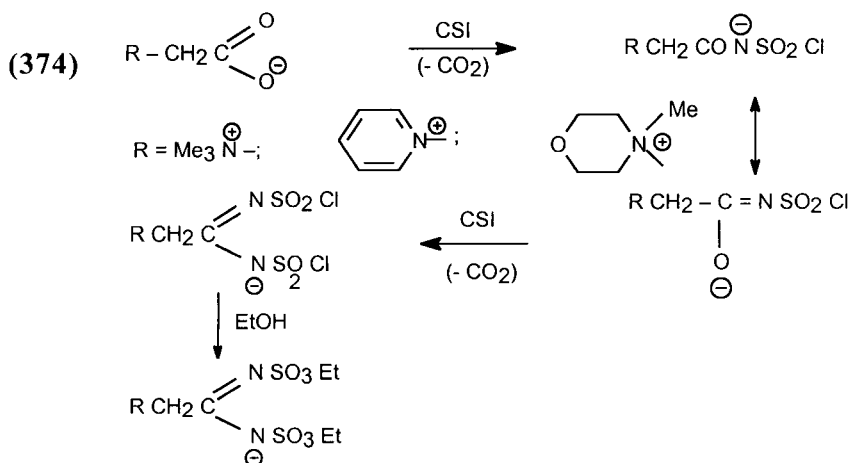
Brown, F., Bernstein, P.R. Cronk, L.A., Dosset, D.L., Hebbel, K.C., Maduskuie, (Jr.), T.P., Shapiro, H.S., Vacek, E.P., Yee, Y.K., *et al.*, *J. Med. Chem.*, **32**, 807 (1989).



Wittmann, H., Sroka, P., Ziegler, E., *Monatsh., Chem.*, **99**, 1962 (1968)

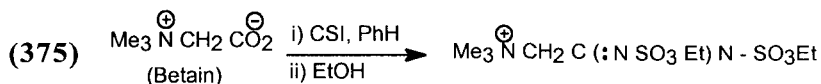


Mathé, S., Rassat, A., *Tet. Lett.*, **39**, 383 (1998).



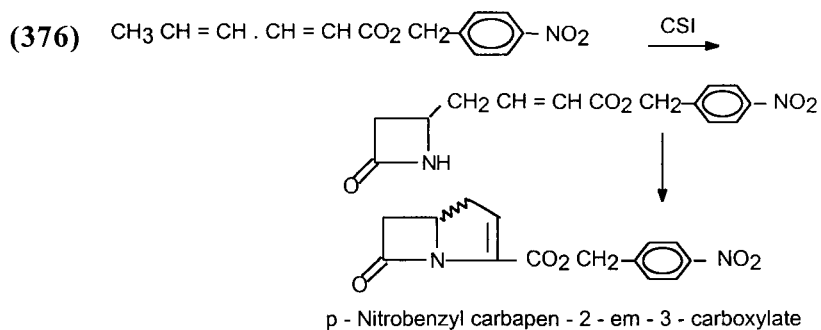
Hoft, E., Ganchow, S., *J. Prakt. Chem.*, **316**, 569 (1974).

Hendrickson, J.B. Jaffee, I., *JACS*, **95**, 4083 (1973).

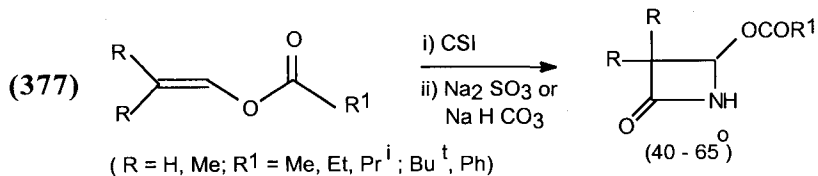


Wittmann, H., Beutal, P., Ziegler, E., *Monatsh. Chem.*, **100**, 1624 (1969)

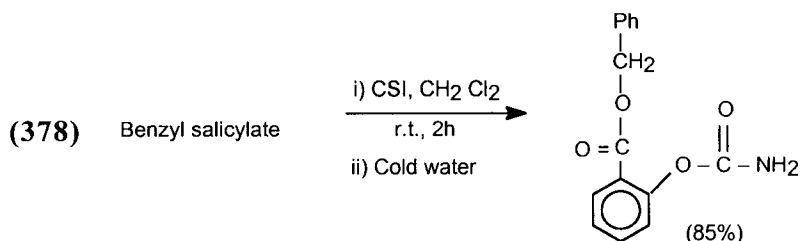
Esters



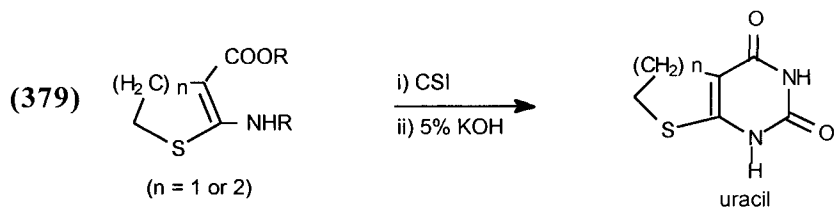
Ueda, U., Damas, C.E., Vinet, V., *Can. J. Chem.*, **61**, 2257 (1983).



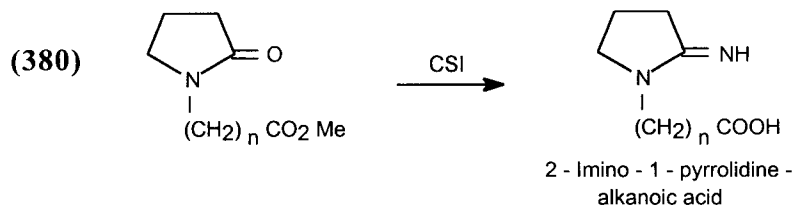
Clauss, K., Grimm, D., Prossel, G., *Ann.*, 539 (1974).



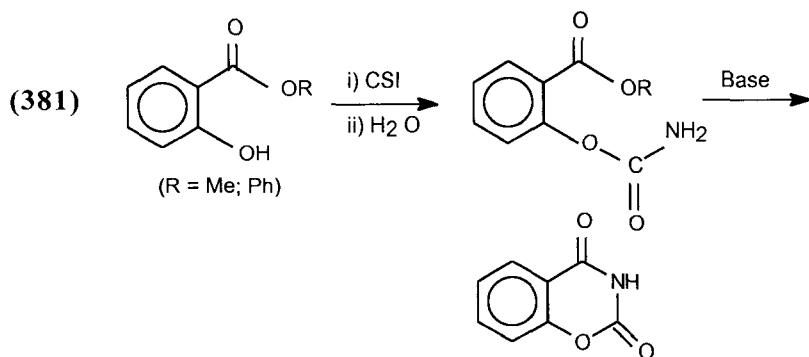
Parameswaran, K.N., Shi, G.Y., Klotz, I.M., *J. Med. Chem.*, **30**, 936 (1987).



Wamhoff, H., Ertas, M., *Synthesis*, 190 (1985).

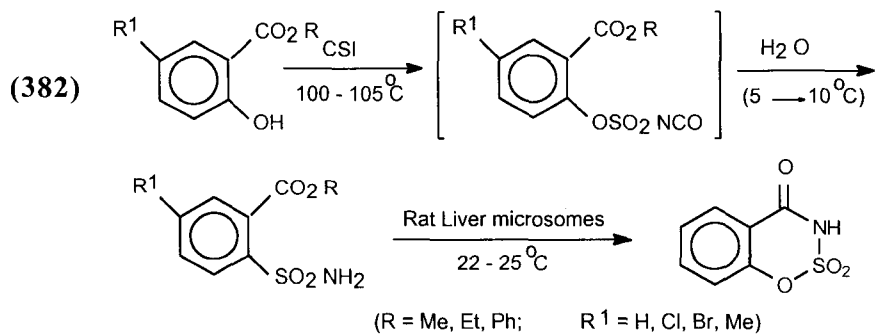


Burden, P.M., Allan, R.D., *Synth. Comm.*, **23**, 1195 (1993).

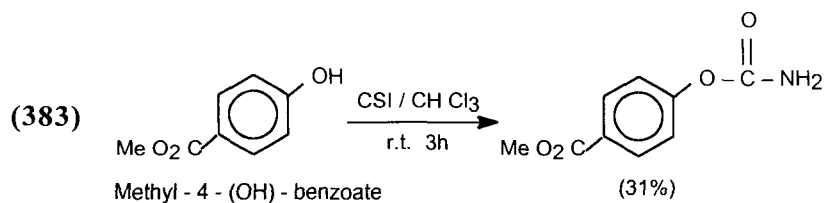


Kamal, A., Sattur, P.B., Thyagarajan, G., Indian Patent Appl. 178/Del/82 (1982), European Patent Appl. 833011745 (1983).

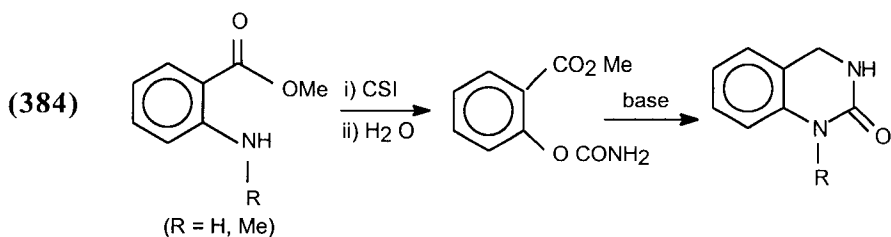
Kamal, A., Ph.D. thesis, Aligarh Muslim University, India (1982).



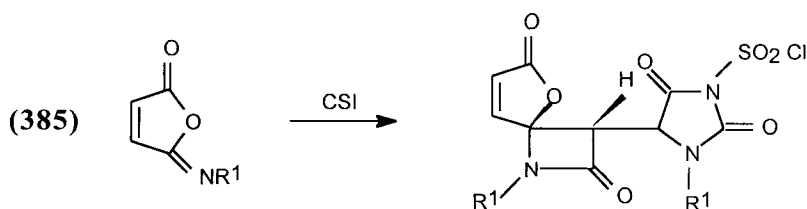
Kamal, A., Rao, A.B. Sattur, P.B., *JOC*, **53**, 4112 (1988).



Parameswaran, K.N. Shi, G-Y., Klotz, I.M., *J. Med Chem.*, **30**, 936 (1987).



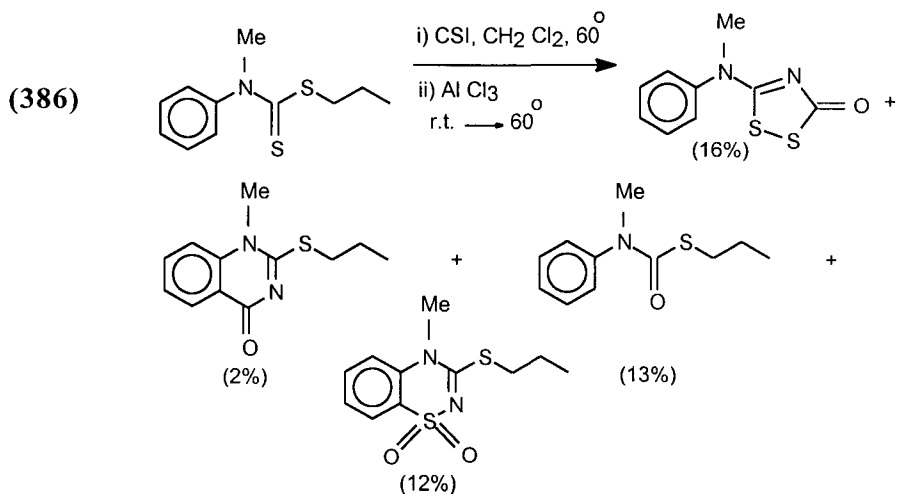
Kamal, A., Ph.D. thesis, Aligarh Muslim University, India (1982).



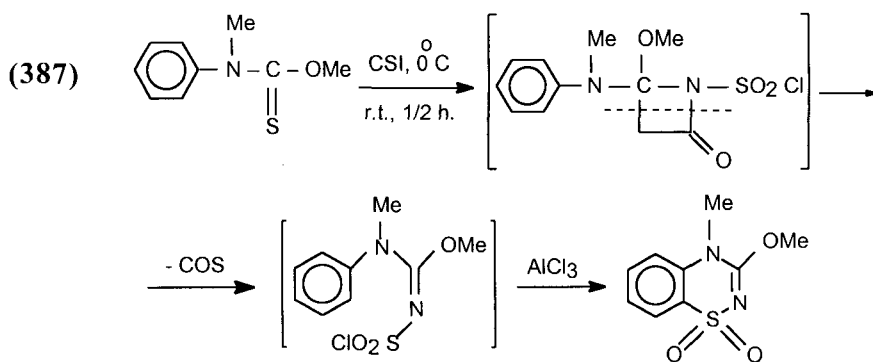
$R^1 = c\text{-C}_6\text{H}_{11}$, $t\text{-C}_4\text{H}_9$, $i\text{-C}_3\text{H}_7\text{CH}_2\text{CH}_2$; $c\text{-C}_5\text{H}_{11}$; PhCH_2 .

Capraro, H.G., Rihs, G., Martin, P., *Helv. Chim. Acta*, **66**, 633 (1983).

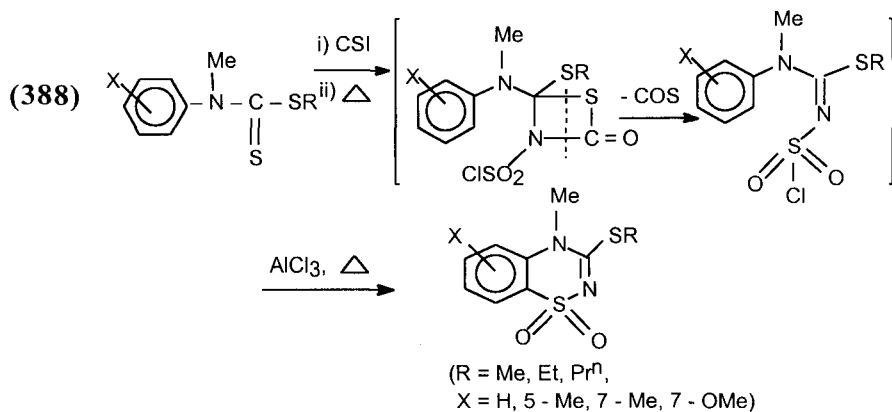
Thioesters



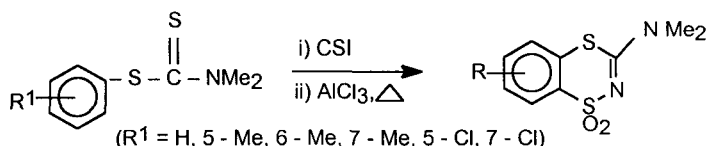
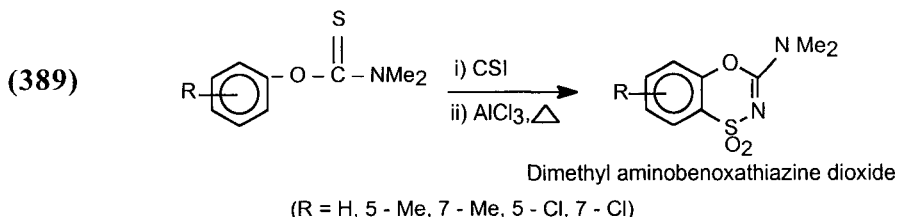
Iwakawa, T., Sato, T., Murabayashi, A., *Heterocycles*, **38**, 1015 (1994).



Iwakawa, T., Tamura, H., Murabayashi, A., Hayase, Y., *Chem. Pharm. Bull.*, **39**, 1939 (1991).

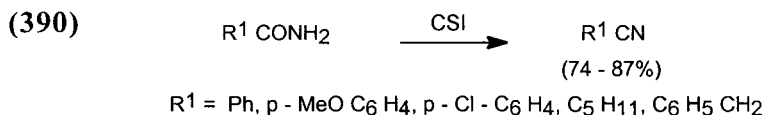


Iwakawa, T., Tamura, H., Hayase, Y., *Chem. Pharm. Bull.*, **38**, 1075 (1990).

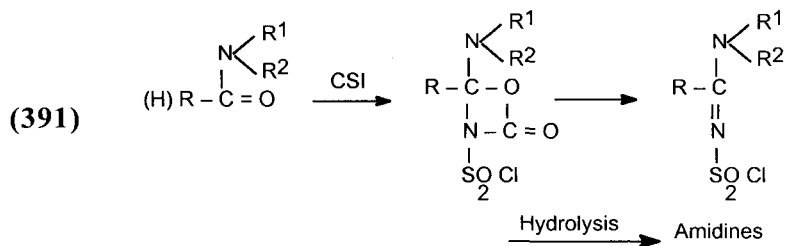


Iwakawa, T., Tamura, H., Murabayashi, A., Hayase, Y., *Chem. Pharm. Bull.*, **39**, 1939 (1991).

Amides

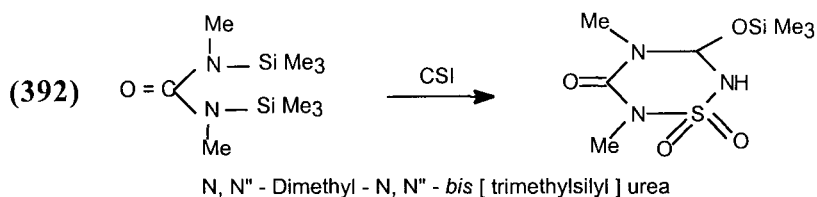


Olah, G.A., Vankar, Y.D., Garcia - luna, A., *Synthesis*, 227 (1979).

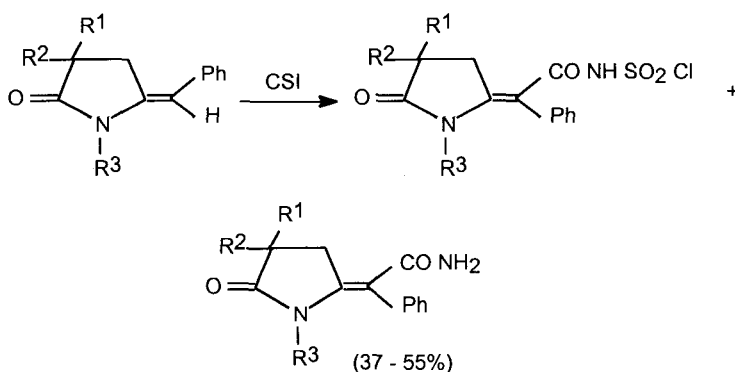
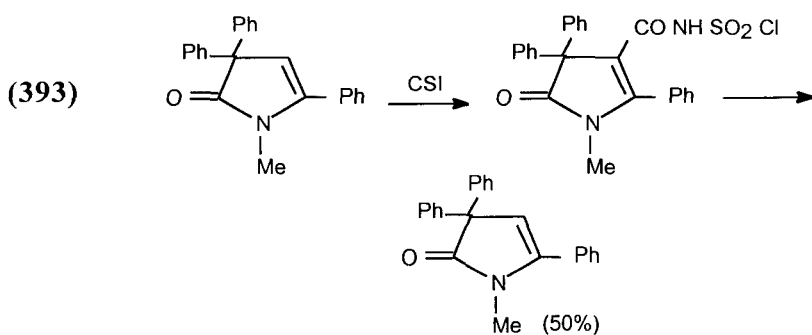


Graf, R., Günther, D., Jensen, H., Matterstock, K., (Farbwerke Hoechst A.G.), German Patent, 1144718, *Chem. Zbl.*, 20282 (1963).

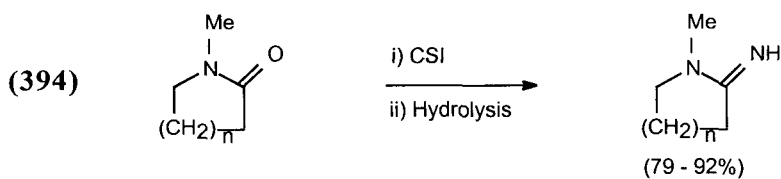
Matterstock, K., Jensen, H., (Farbwerke Hoechst A.G.), German Patent, 1168896, 1962.



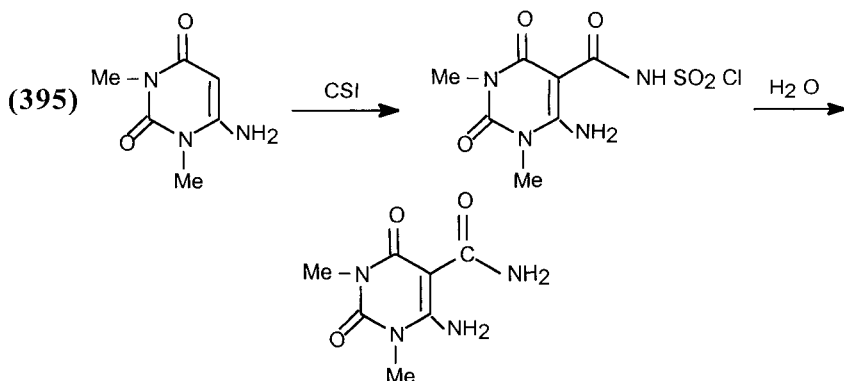
Roesky, H.W., Zamankhan, H., *Chem. Ber.*, **109**, 2107 (1976).



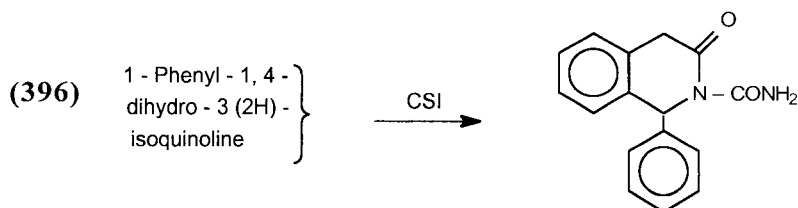
Foucaud, A., Gouriou, Y., *Bull. Soc. Chim. Fr.*, 1500 (1971).



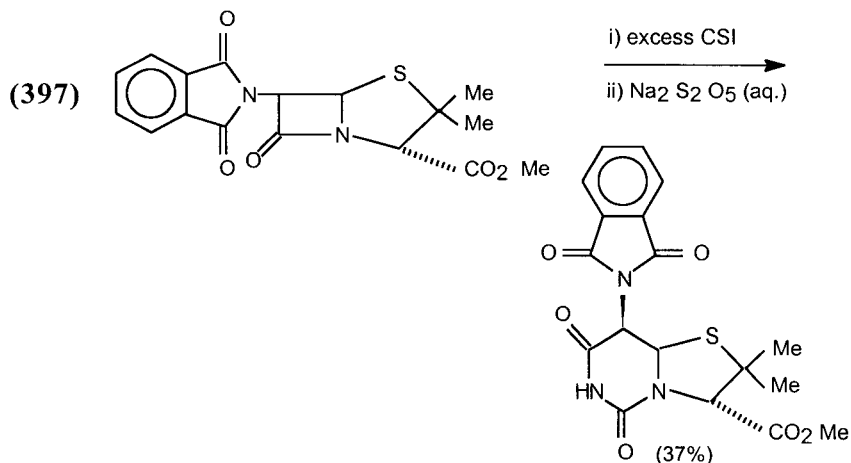
Rao, K.R., Nageswar, Y.V.D., Srinivasan, T.N., Sattur, P.B., *Synth. Comm.* **18**, 877 (1988).



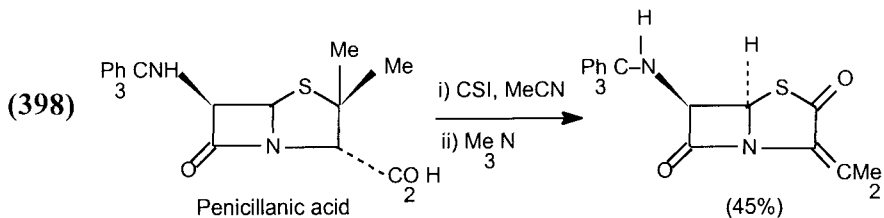
Bennett, G.B., Simpson, W.R.J., Mason, R.B., Strochschein, R.J., Mansukhani, R., *JOC*, **42**, 221 (1977).



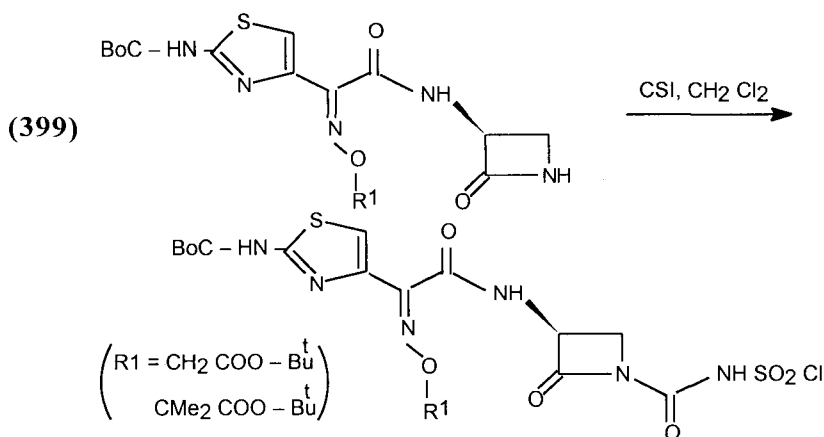
Zara - Kaczian, E., Deak, G., *Acta Chim. Hung.*, **116**, 89 (1984).



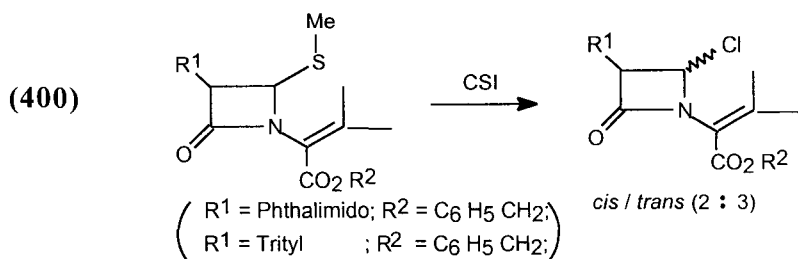
Campbell, M.M., Harcus, R.G., Nelson, K.H. *JCS Perkin Trans. I*, 817 (1978).



Faubl, H., *JOC*, **41**, 3048 (1976).

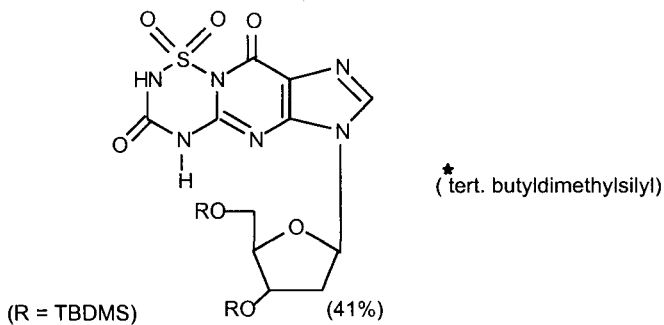
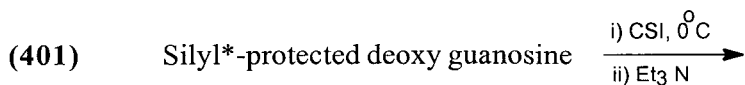


Barbachyn, M.R., Tuominen, T.C., *J. Antibiot.*, **43**, 1199 (1990).

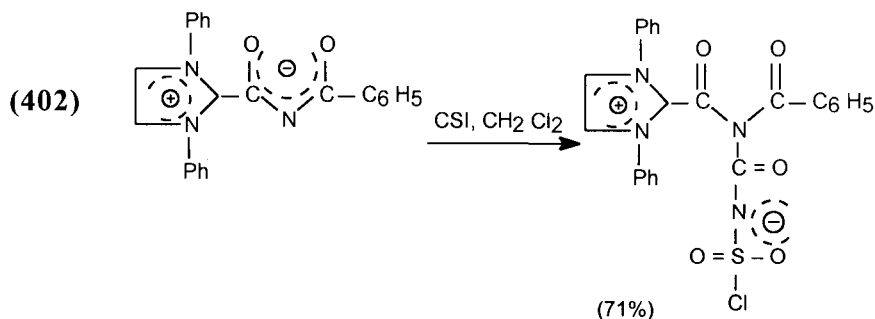


Ponsford, P.J., Baxter, A.J.G., Southgate, P.M. East Eur. Pat. Appl. 3740 (1979); C.A. **92**, 76280 (1979).

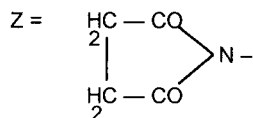
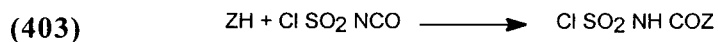
Smale, T.C., Eur. Pat. Appl. 2564 (1979); C.A. **92**, 76279 (1980).



Camus, P., Lhomme, M-F., Lhomme, J., *Tet. Lett.*, **30**, 467 (1989).

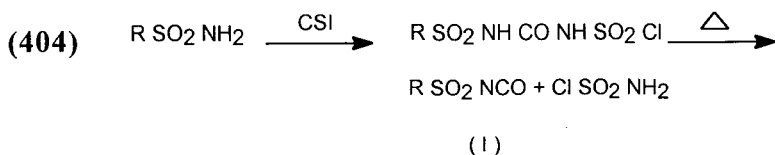


Schossler, W., Regitz, M., *Chem. Ber.*, **107**, 1931 (1974).



Lattrell, R, Lohaus, G., *Chem. Ber.*, **105**, 2800 (1972).

Sulfonamides

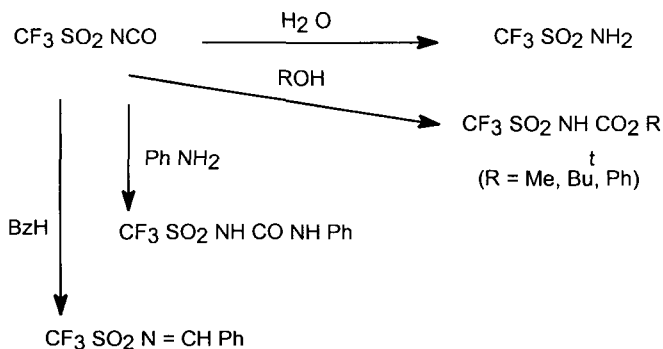
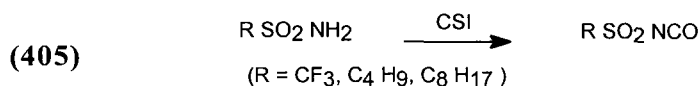


R = CF₃, C₄H₉, C₈H₁₇; % yield (I) = 75 - 92.

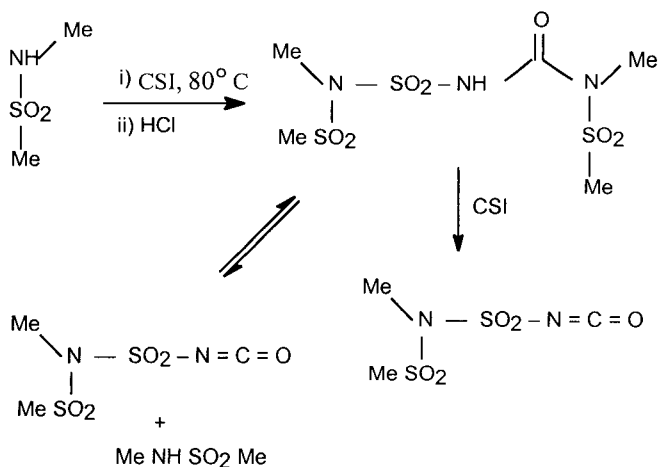
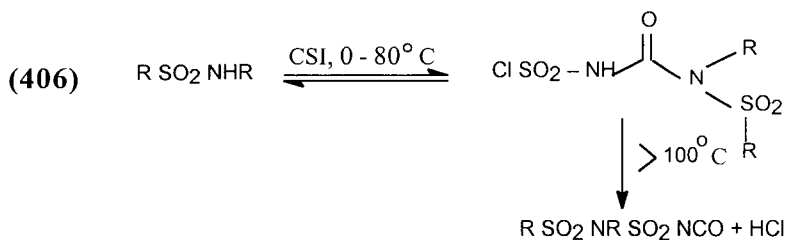
R = Ph, p-Me C₆H₄, Me; % yield (I) = 18 - 30.

Appel, R., Montenash, M., *Chem. Ber.*, **107**, 706 (1974).

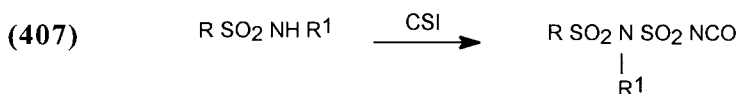
Roesky, H.W., Tutkunkardes, S., *Chem. Ber.*, **107**, 508 (1974).



Behrend, F., Haas, A., *Chem. Ztg.*, **95**, 23 (1971). C.A. **76**, 58900 (1972).

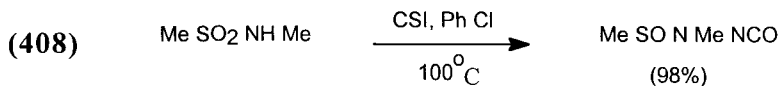


Warm, A., Bernardinelli, G., *JOC*, **59**, 5340 (1994).



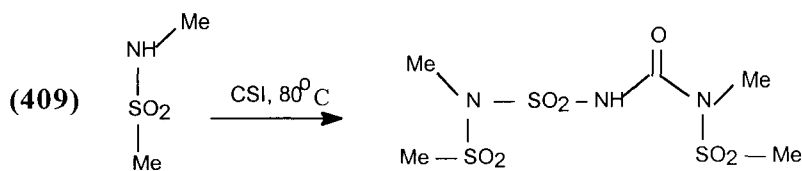
Farbwerke Hoechst A-G. DAS 2257240; *Angew Chem. Int. Ed. Engl.*, **13**, 748 (1974)

Lohaus, G., Midenberger, H., U.S. Patent 3, 931, 277 (1976).

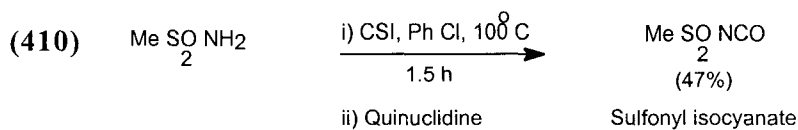


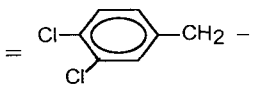
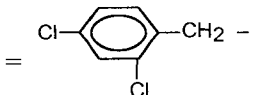
Schlegel, G., Lachheim, S., Berger, H. (Hoechst. A.G., Germany).

Eur. Pat. Appl. EP 501369. C.A. **118**, 8613 (1993).



Warm, A., Bernardinelli, G., *JOC*, **5**, 5340 (1994).

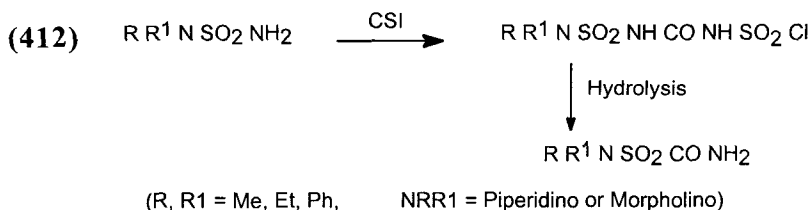


Sulfonyl isocyanate (RSO_2NCO)	% yield
R = Et	52
= Pr	62
= Me_2CH	50
= Bu	65
= PhCH_2	62
= $2\text{-Cl-C}_6\text{H}_4\text{-CH}_2$	52
= 	—
= 	—

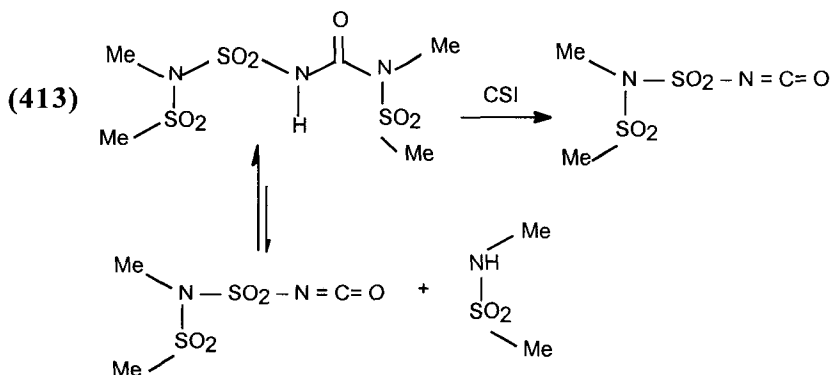
Mengel, R., (Celamerck G.m.b.H. und Co., K— G.) Ger. Offen DE 3, 228, 101, C.A. **100**, 174264ⁿ (1984).



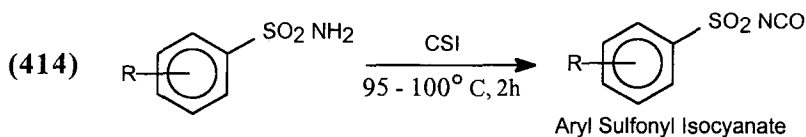
Behrend, E., Haas, A., *J. Fluorine Chem.*, **4**, 83 (1974).



Appel, R., Motenash, M., *Chem. Ber.*, **108**, 616 (1975).

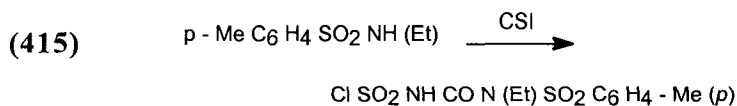


Warm, A., Bernardinelli, G., *JOC*, **59**, 5340 (1994).



(R = H, Halo, NO₂, Lower alkoxy, CF₃ etc.)

Celamerck G.m.b.H. und Co. K-G., Ger. Offen DE 3,132, 944., C.A. **98**, 215319^v (1983).

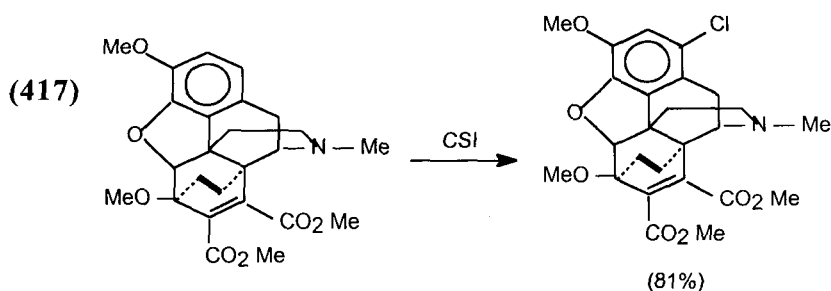


Lattrell, R., Lohaus, G., *Chem. Ber.*, **105**, 2800 (1972).

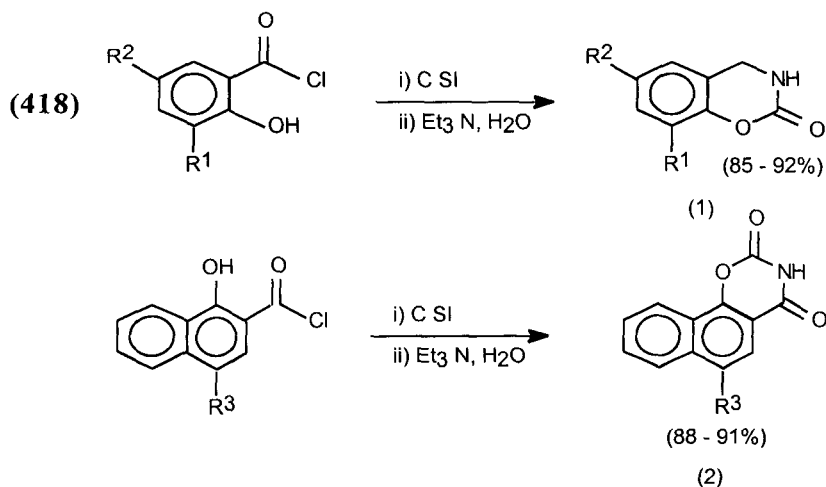
(416) Chlorinating Agent

CSI acts as a chlorinating agent when allowed to react with an alkane (under free radical conditions, viz, UV irradiation or thermal initiation). Tertiary hydrogens are selectively replaced by chlorine compared to primary hydrogens (120 : 1) and the H-abstracting entity in the isocyanate radical.

Mosher, M.W. Eates, G.W., *JOC*, **47**, 1875 (1982).



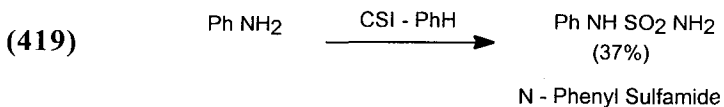
Giger, R., Rubenstein, R., Ginsburg, D., *Tetrahedron*, **29**, 2392 (1973).

Acid Chloride

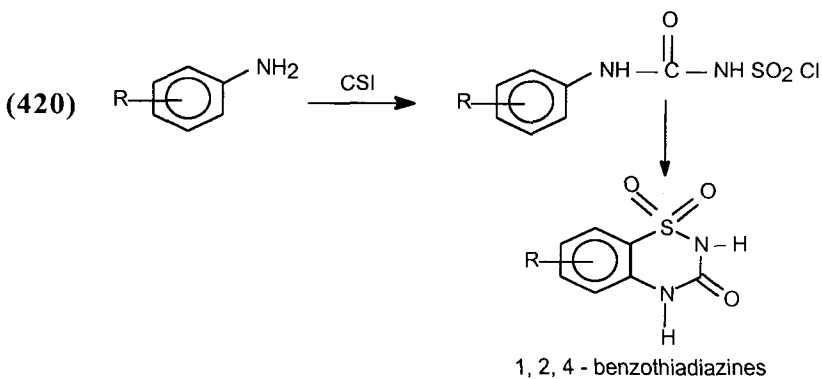
<i>Compd. No.</i>	<i>R</i> ¹	<i>R</i> ²	<i>R</i> ³	Yield, %
1a	H	H	-	92
1b	H	Br	-	85
1c	Br	Br	-	86
2a	-	-	H	91
2b	-	-	Br	88

Dhar, D.N. Bag, A.K., *Ind. J. Chem.*, **21B**, 366 (1982).

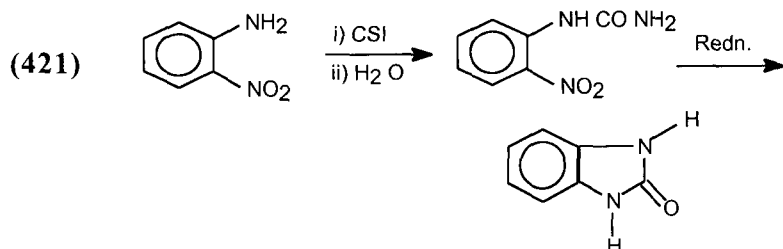
Amino and Imino Compounds



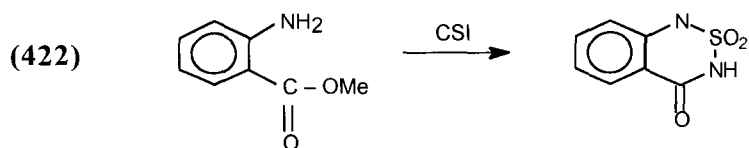
Lee, C -H., Kohn, H., *JOC*, **55**, 6098 (1990).



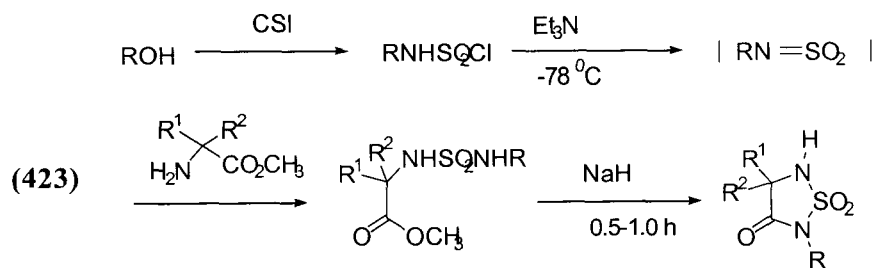
Ejmocki, Z., Ochal, Z., Rodakowski, K., *Przem. Chem.*, **72**, 449 (1993).
C.A., **121**, 57471^a (1994).



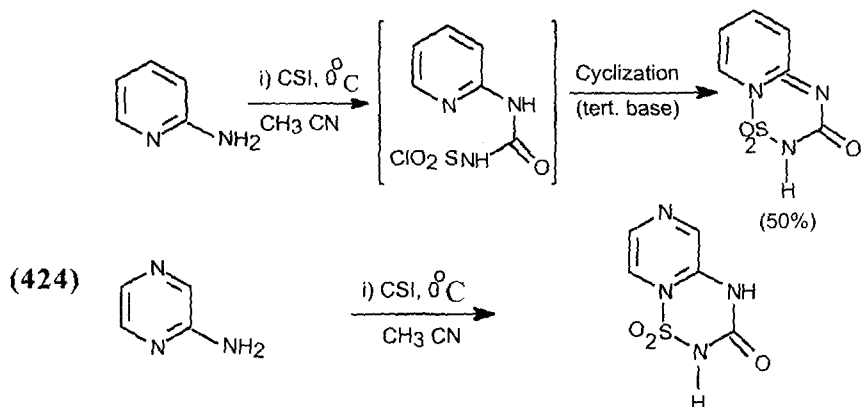
Hoechst. A.G., German Patent 2, 855, 884. C.A. **94**, 15413^b (1981).



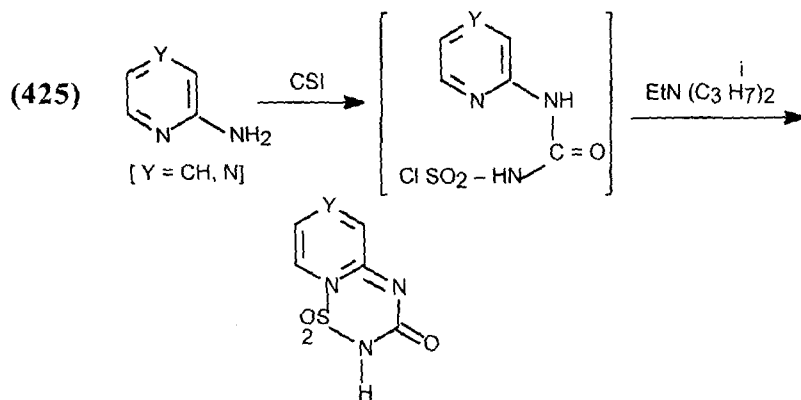
Cohen, E., Klarberg, B., *JACS*, **84**, 1994 (1962).



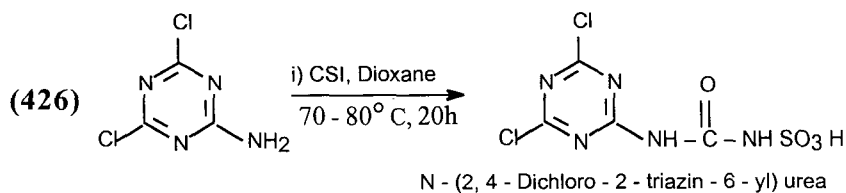
Xiao, Z., Timberlake, J., *J. Heterocycl. Chem.*, **37**, 773 (2000).



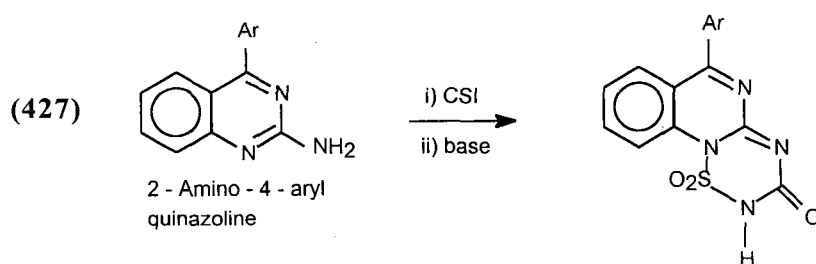
Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A., Tull, R.J., Weinstock, L.M. *Heterocycles*, **12**, 815, 1199 (1979).



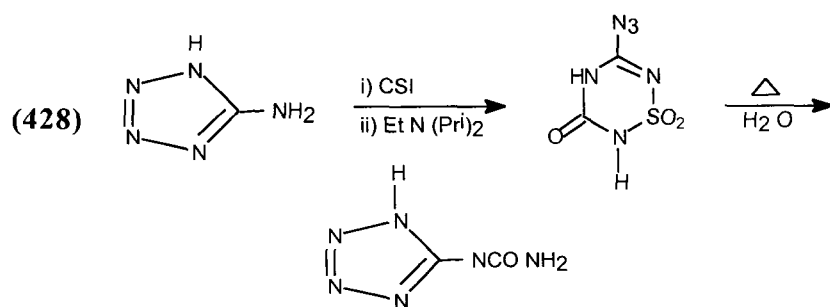
Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A., Tull, R.J., Weinstock, L.M. *Heterocycles*, **12**, 815, 1199 (1979).



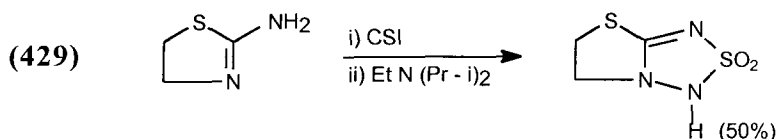
Rainer, R., Swiss Patent 580, 608 C.A. **86**, 29891 (1977).



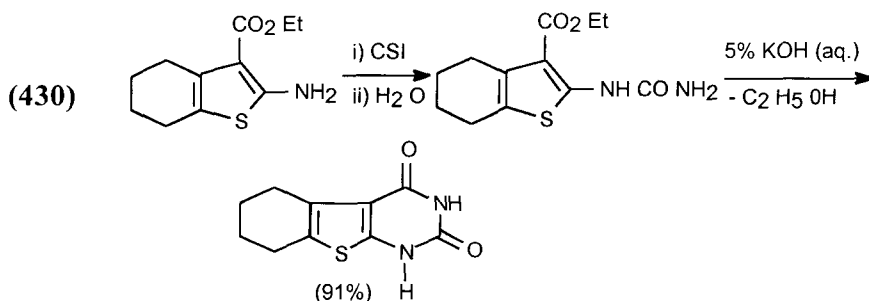
Kamal, A., Sattur, P.B., unpublished work, 1982.



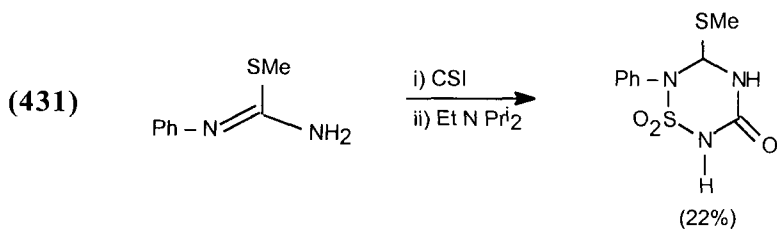
Pasto, D.J., Chen, A.F.T., *Tet. Lett.*, **14**, 713 (1973).



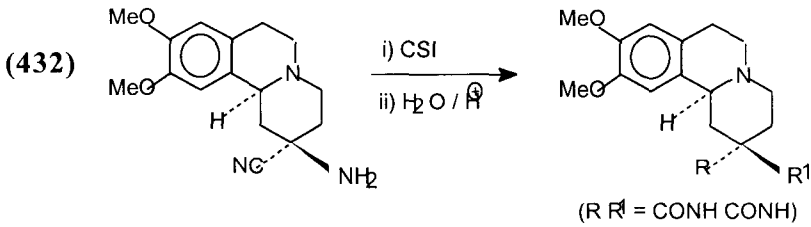
Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A., Tull, R.J., Weinstock, L.M. *Heterocycles*, **12**, 1199 (1979).



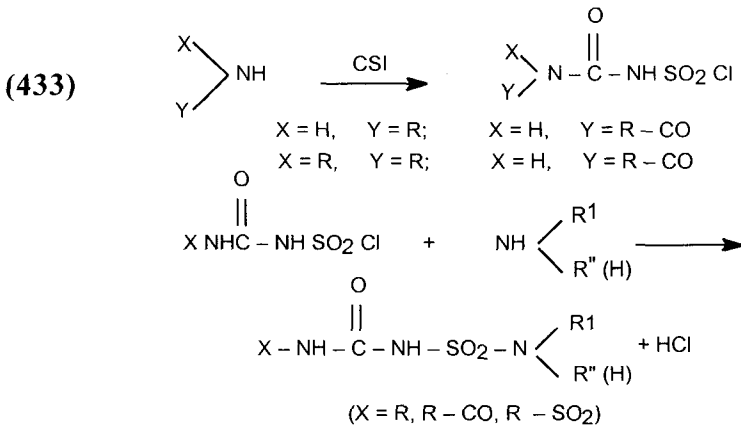
Wamhoff, H., Ertas, M., *Synthesis*, 190 (1985).



Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A., Tull, R.J., Weinstock, L.M. *Heterocycles*, **12**, 815 (1979).

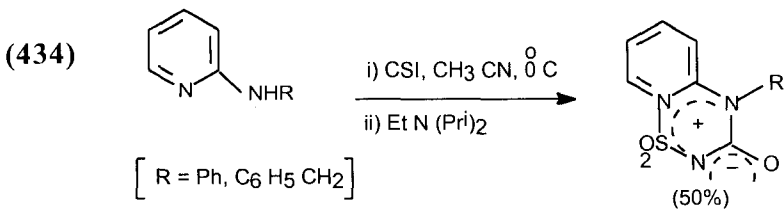


Menendez, J.C., Diaz, M.P., Bellver, C., Sollhuber, M.M., *Eur. J. Med. Chem.*, **27**, 61 (1992).

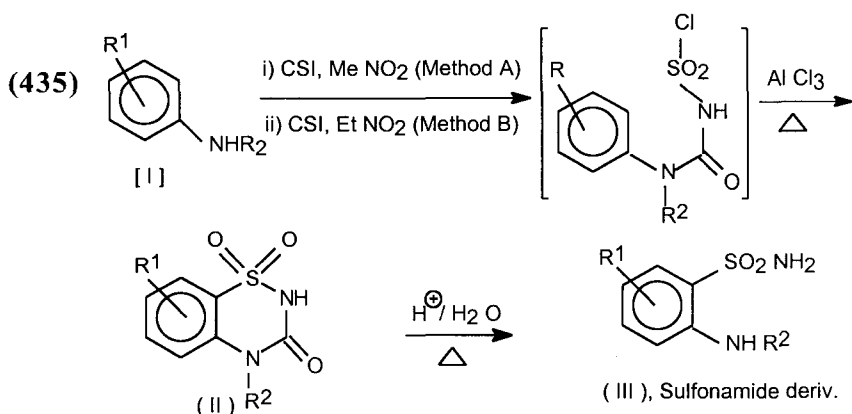


Graf. R., (Farbwerke Hoechst A.G. 1952), German Patent, 931467, *Chem. Zbl.*, 11094 (1955).

Graf. R., (Farbwerke Hoechst A.G. 1952), German Patent, 940292, *Chem. Zbl.*, 12973 (1956).



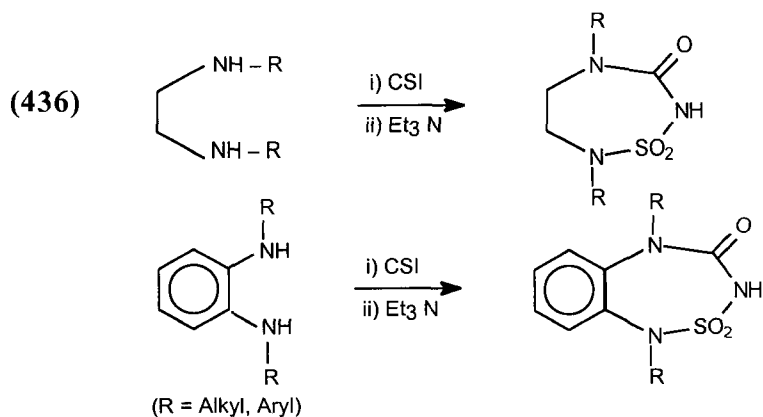
Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A., Tull, R.J., Weinstock, L.M. *Heterocycles*, **12**, 815, 1199 (1979).



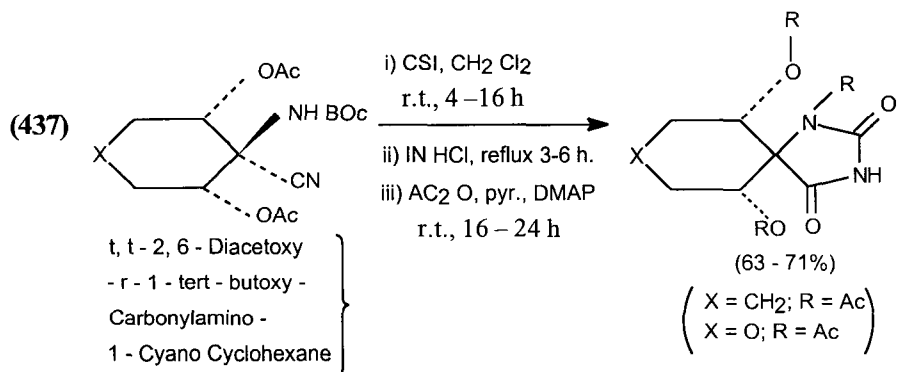
Adduct I R ¹	Product II, R ¹	Product III, R ¹	R ² (I-III)	Yield, %			
				II		III	
				Method A	Method B	Method A	Method B
H	H	H	H	85	67	90	-
4-Me	7-Me	5-Me	H	92	66	96	-
2-Me	5-Me	3-Me	H	87	66	-	73
4-Cl	7-Cl	5-Cl	H	65	69	-	70
3-Br	6-Br	4-Br	H	50	42	-	77
4-MeO	7-MeO	5-MeO	H	83	61	84	-
H	H	H	Me	74	64	89	-
H	H	H	Ph	89	89	-	42

Girard, Y., Atkinson, J.G., Rokach, J., *JCS Perkin Trans. I*, 1043 (1979).

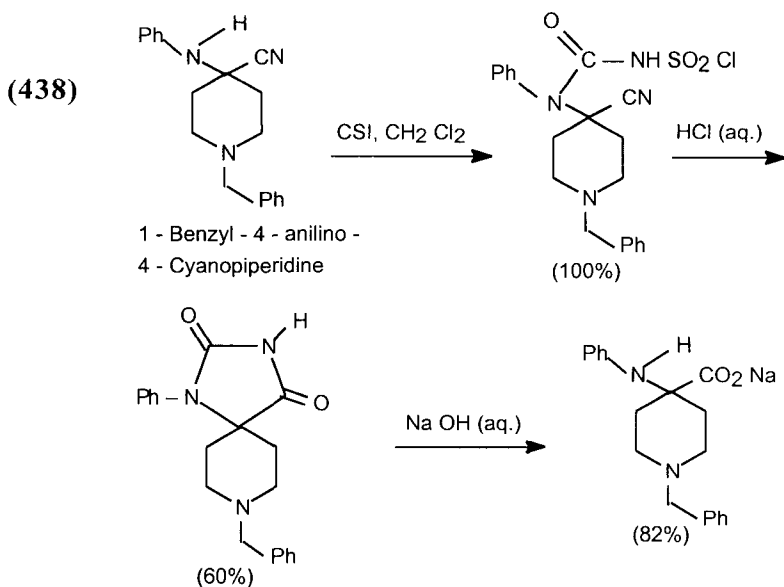
Graf, R., *Org. Synth.*, **46**, 23 (1966).



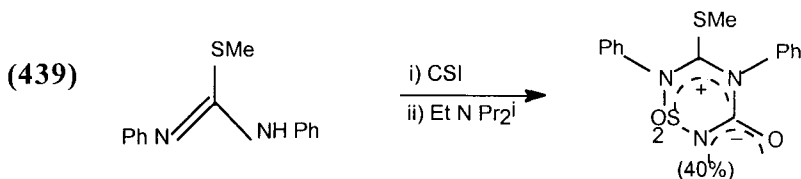
Otto, E., Durkheimer, W., Muschweck, R., German Patent 2,409, 355.



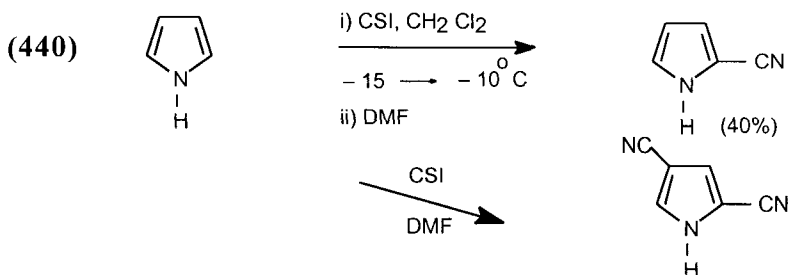
Santoyo, G.F., Robles Diaz, R., Calvo-Flores, F.A.G., Vargas Berenguel, A., Gimenez, M., *Synthesis*, 631 (1992).

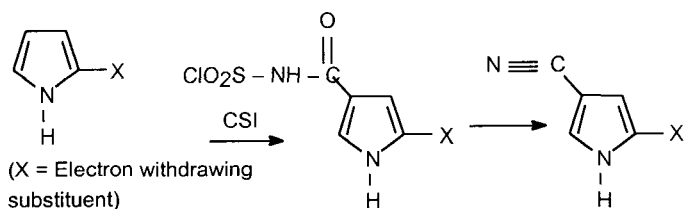


Feldman, P.L. and Brackeen, M.F., *JOC*, **55**, 4207 (1990).



Karady, S., Amato, J.S., Dortmund, D., Patchatt, A.A., Reamer, R.A.,
Tull, R.J., Weinstock, I.M. *Heterocycles*, **12**, 815 (1979).





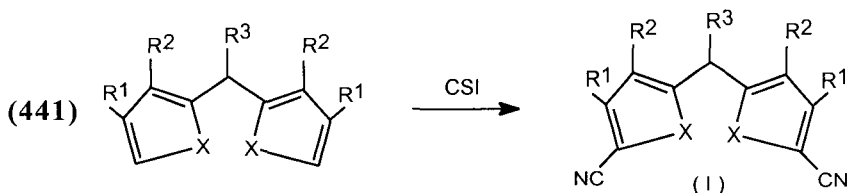
Barnet, G.H., Anderson, H.J., Loader, C.E., *Can. J. Chem.*, **58**, 409 (1980).

Loader, C.E., Barnet, G.H., Anderson, H.J., *Can. J. Chem.*, **60**, 383 (1982).

Anderson, H.J., Loader, C.E., Foster, A., *Can. J. Chem.*, **58**, 2527 (1980).

Loader, C.E., Anderson, H.J., *Can. J. Chem.*, **59**, 2673 (1980).

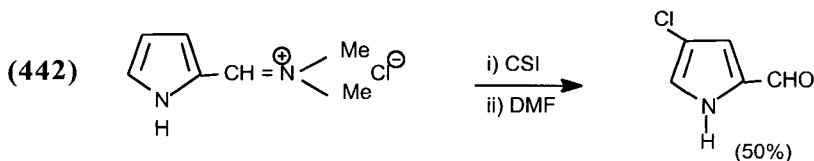
Floyd, A.J., Kinsman, R.G., Roshan-Ali, Y., Brown, D.W., *Tetrahedron*, **39**, 3881 (1983).



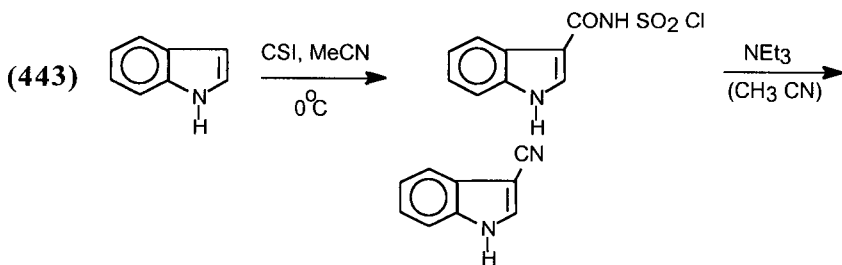
X	R ¹	R ²	R ³	% yield, I.
NH	Et	Et	H	62
NH	Me	Et	H	56
NH	CH ₂ CO ₂ Et	CH ₂ CO ₂ Et	H	46
NH	Et	Me	Ph	35
NH	H	H	3,4,5(MeO) ₃ C ₆ H ₂	42
NH	H	H	F ₅ C ₆	39
NH	H	H	4-t-Bu Ph	32

NH	H	H	4 - (CO ₂ Me) C ₆ H ₄	37
NH	H	H	H	39
O	H	H	H	70

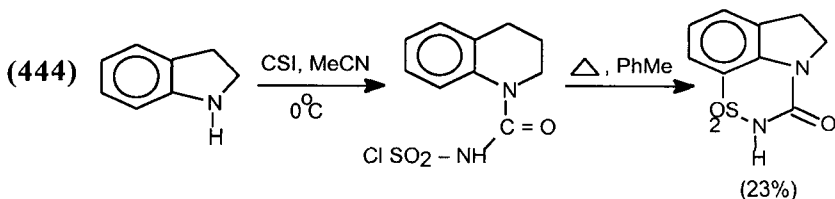
Boyle, R.W., Karnaratne, V., Jasat, A., Mar, K.E., Dolphin, D., *Synlett.*, **11**, 939 (1994).



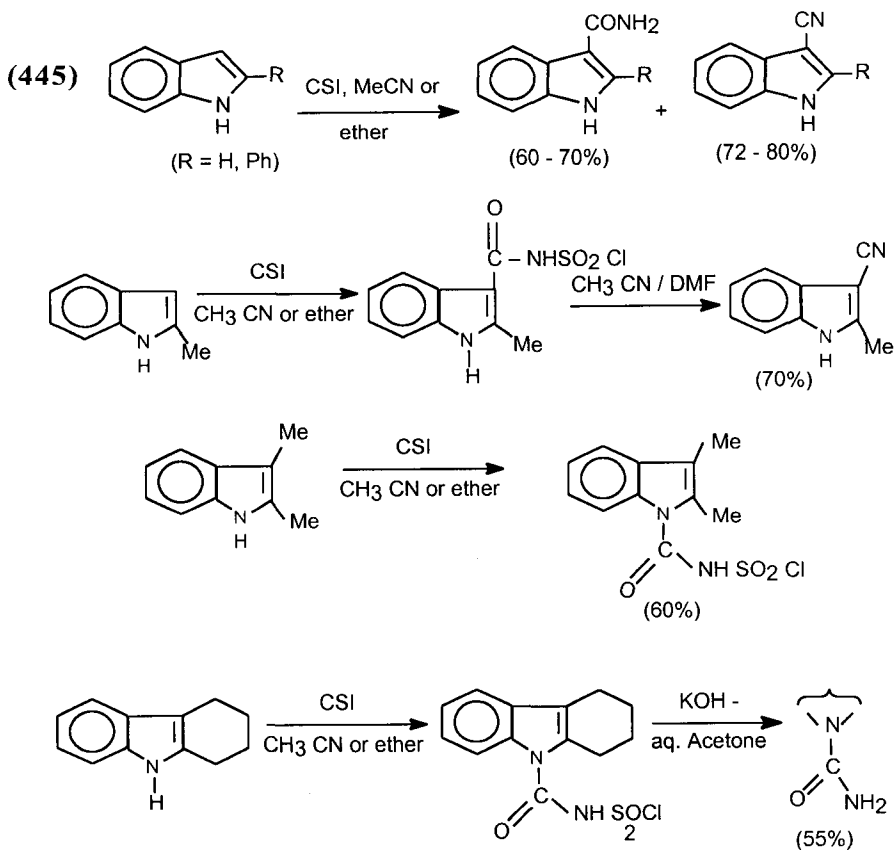
Anderson, H.J., Loader, C.E., Foster, A., *Can. J. Chem.*, **58**, 2527 (1980).



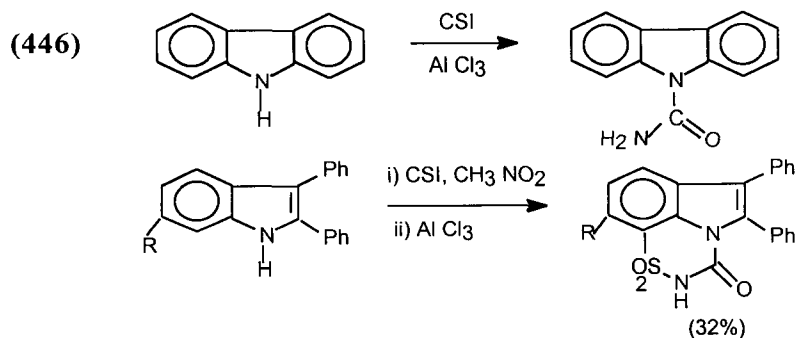
Vorbruggen, H., Krolkiewicz, *Tetrahedron*, **50**, 6549 (1994).

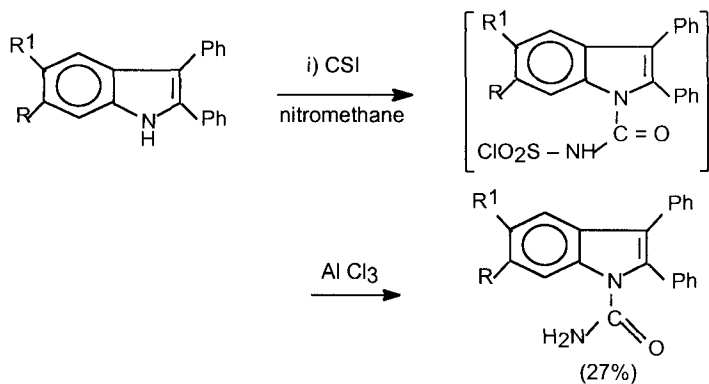


Borrer, A.L., Chinoporos, E., Filosa, M.P., Herchen, S.R. Petersen, C.P., Stern, C.A., Onan, K.D., *JOC*, **53**, 2047 (1988).

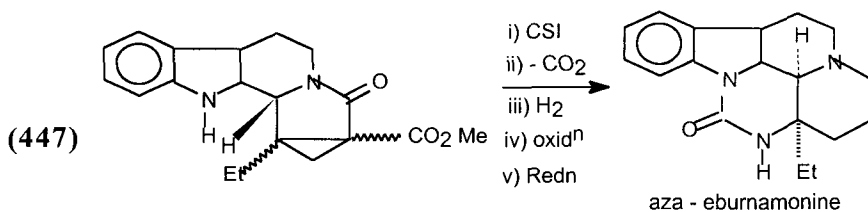


Mehta, G., Dhar, D.N., Suri, S.C., *Synthesis.*, 374 (1978).

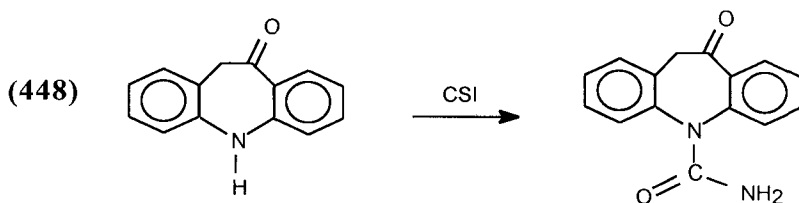




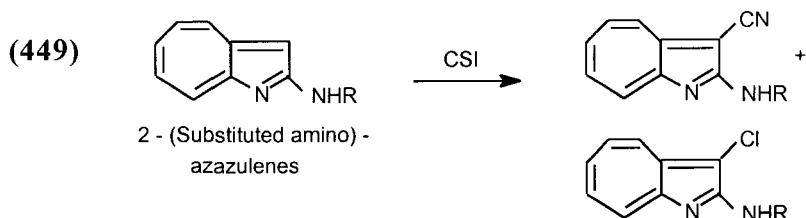
Kamal, A., Narender, A.V., Sattur, P.B., *Heterocycles*, **24**, 3397 (1986).



Hammer, H., Winterfeldt, E., *Tetrahedron*, **37**, 3609 (1981).



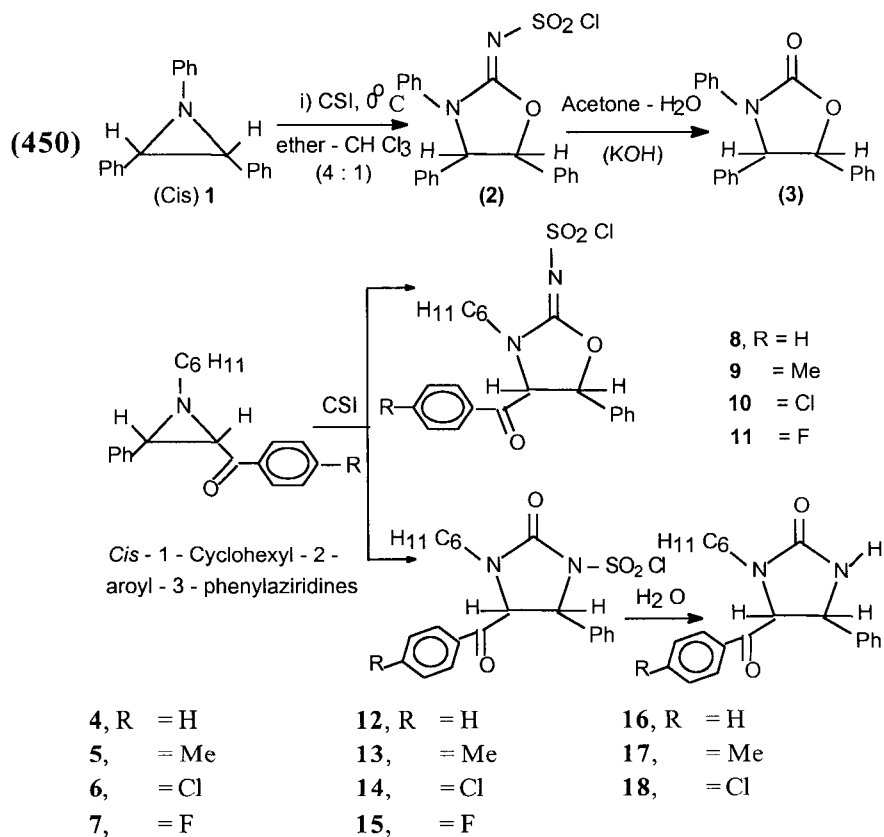
Milanesi, A., (Trifarma, S.R.L., Italy), *PCT Int. Appl.*, WO 9621649.
C.A. **125**, 195448 (1996).

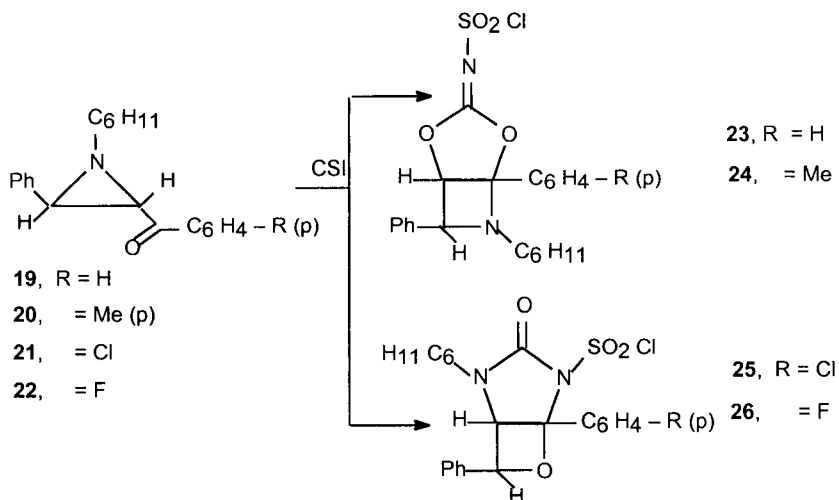


Abe, N. Matsuda, H. Sugihara, Y., Kakehi, A., *J. Heterocycl. Chem.*, **33**, 1323 (1996).

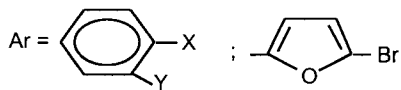
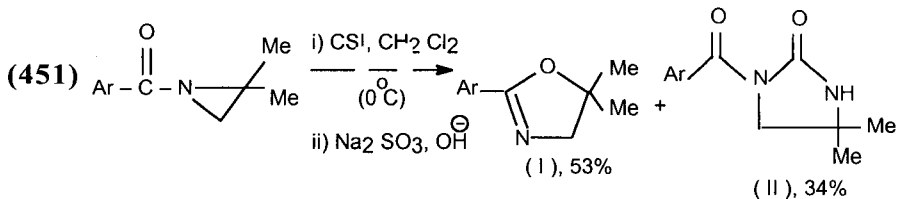
Nitrogen Compounds

Aziridines/Azirines





Keshava Murthy, K.S., Dhar, D.N., *J. Heterocycl. Chem.*, **21**, 1699 (1984).



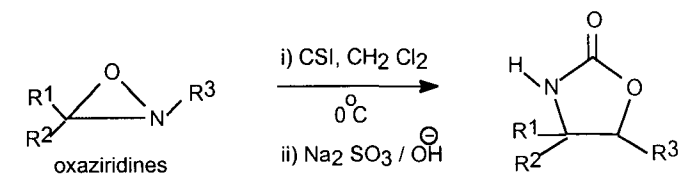
X = H, Me, CMe₃, Br, Cl, OMe, NO₂

Y = H, Cl

When Ar = Ph; Products (I) and (II) are :

2 - Phenyl - 5, 5 - dimethyl - 2 - oxazoline.

3 - Benzoyl - 5, 5 - dimethyl - 3 - imidazolidin - 2 - one.

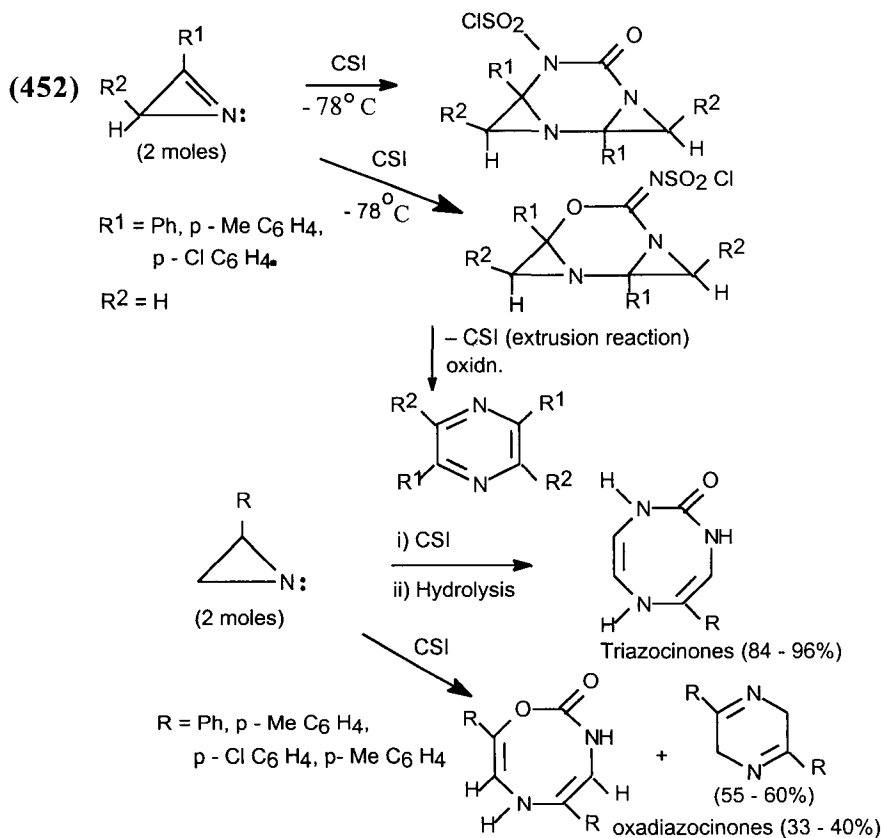


R¹ = H, Me, Et;

R² = Me, Et, -X (Where X = H, Me, F, Cl, Br)

R³ = C₄H₉^t, PhCH₂, C₆H₁₁

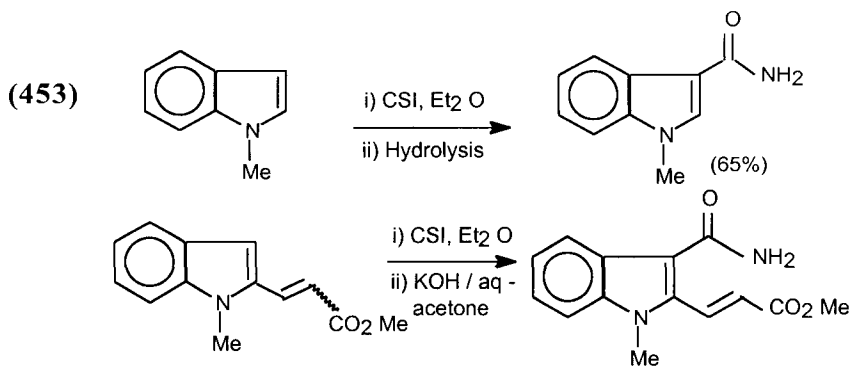
Pramod Kumar, Ph.D. Thesis, I.I.T., Kanpur, India (1994).



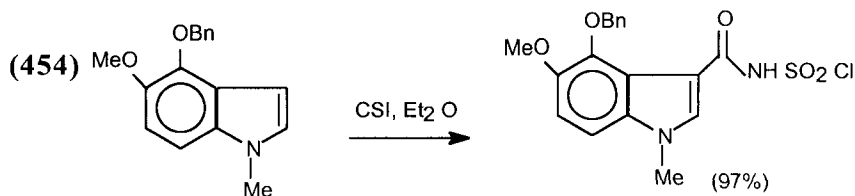
Daniel, J., Dhar, D.N., *Synth. Comm.*, **21**, 1649 (1991).

Daniel, J., Dhar, D.N., *Synth. Comm.*, **23**, 2151 (1993).

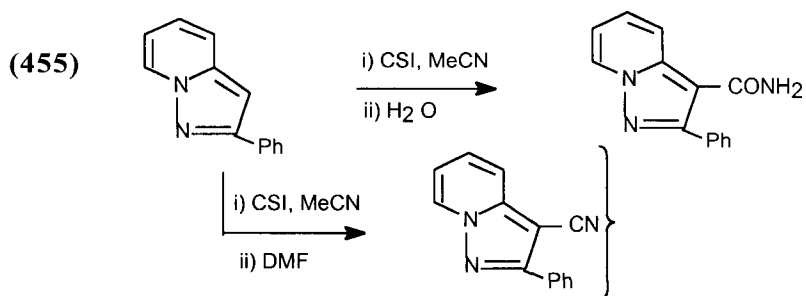
Nitrogen Heterocycles



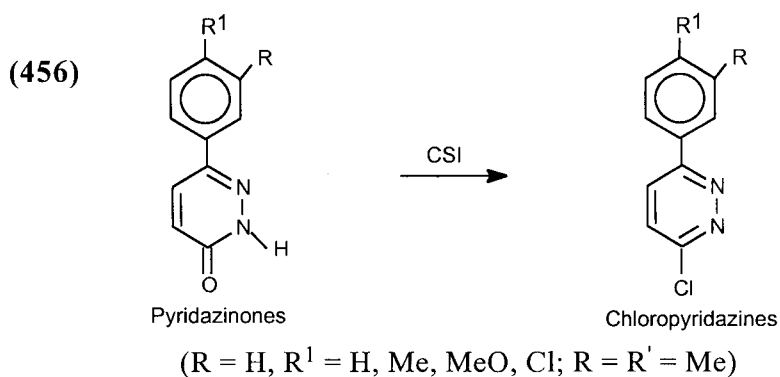
Pindur, U., Kim, M-H., *Tetrahedron*, **45**, 6427 (1989).



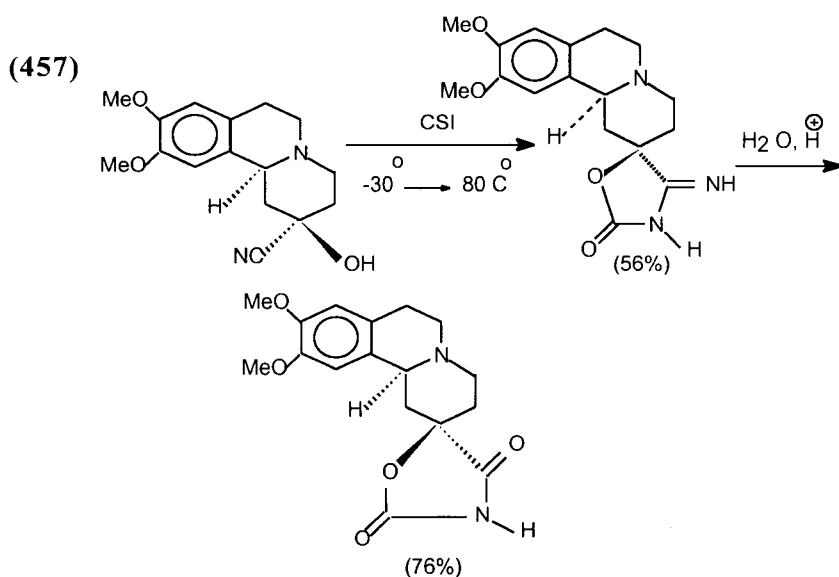
Moody, J.C. Swann, E., *Tet. Lett.*, **34**, 1987 (1993).



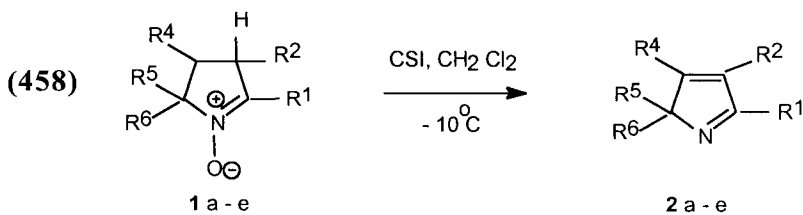
Yasuyoshi, M., Yagi, S., Hachiken, H., Ikeba, M., *Heterocycles*, **38**, 1881 (1994).



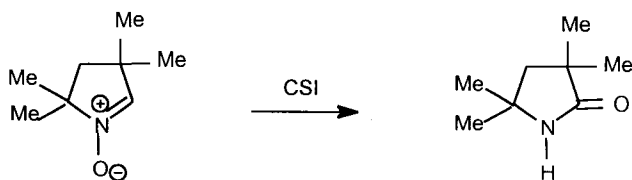
Srinivasan, T.N., Rao, K.R. Sattur, P.B., *Synth. Comm.*, **16**, 543 (1986).



Menendez, J.C. Villacampa, M., Söllhuber, M.M., *Heterocycles*, **32**, 469 (1991).

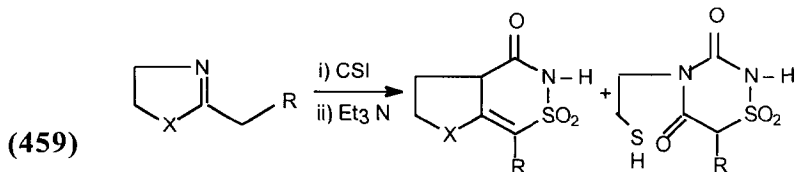


- 1a $R^1, R^4 = \text{Ph}; R^2, R^3 = \text{H}; R^5, R^6 = \text{H}$
 1b $R^1, R^2 = \text{Ph}; R^3, R^4 = \text{H}; R^5, R^6 = \text{Me}$
 1c $R^1 = \text{C}_5\text{H}_4\text{N}; R^2, R^3 = \text{H}; R^4 = \text{Ph}; R^5, R^6 = \text{Me}$
 1d $R^1, R^4 = \text{Ph}; R^2, R^3 = \text{H}; R^5, R^6 = \text{-(CH}_2\text{)}_5\text{-}$
 1e $R^1 = \text{Ph}; R^2, R^3, R^4 = \text{H}; R^5, R^6 = \text{Me}$

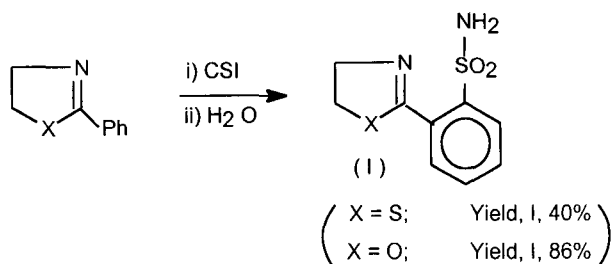


Joseph, S.P., Dhar, D.N., *Synth. Comm.*, **18**, 1743 (1988).

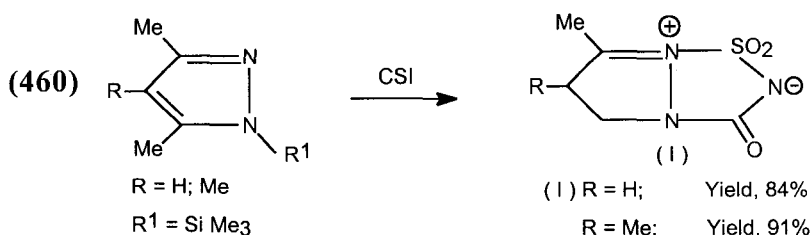
Joseph, S.P., Dhar, D.N., *Tetrahedron*, **44**, 5209 (1988).



- a) $R = \text{Me}; X = \text{S}$
 b) $R = \text{Me}; X = \text{O}$
 c) $R = \text{H}; X = \text{S}$

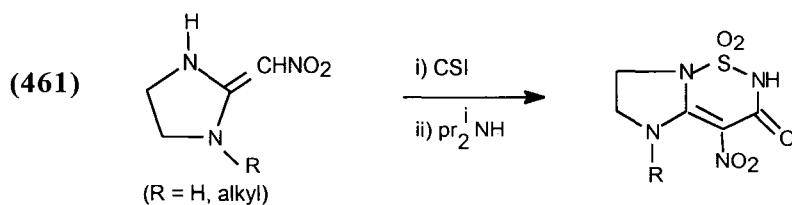


Daniel, J., Dhar, D.N., *Synth. Comm.*, **23**, 121 (1993).

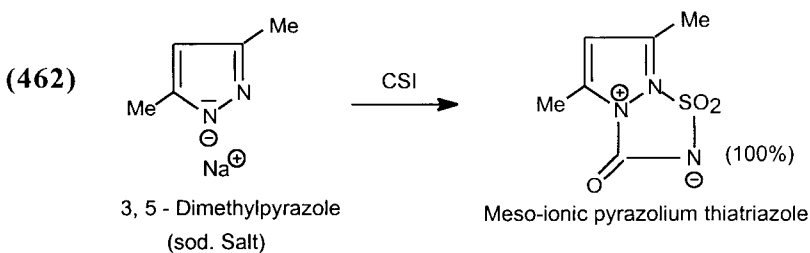


I = 1, 2, 3, 5 - Thiatriazolo - [1, 2 - b] pyrolozium - 5, 5 - dioxide

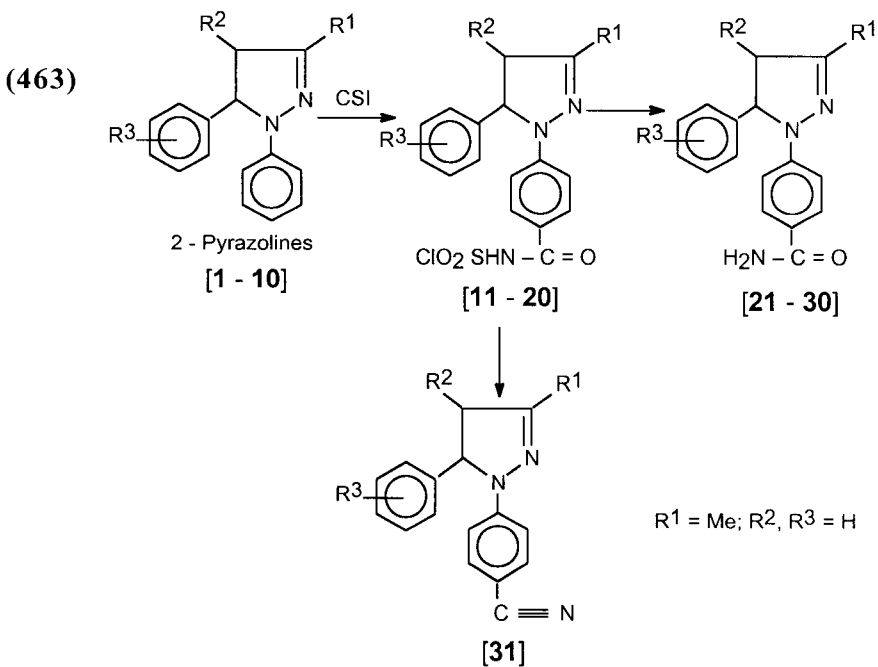
Friedrichsen, W., Boettcher, A., Debaerdemaeker, T., *Heterocycles*, **20**, 845 (1983).



Reddy, A.V.N., Maiti, S.N., Singh, I.P., Micotich, R.G., *Synth. Comm.*, **19**, 3021 (1989).



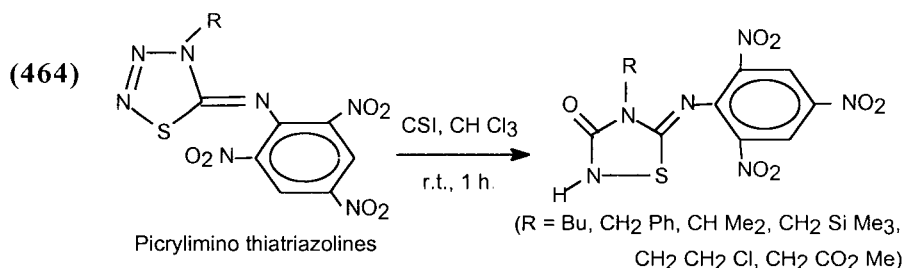
Grandberg, I.I., Nam, N.L., *Khim Geterotsikl Soedin*, 134 (1994).
C.A. 122, 9953^h (1995).



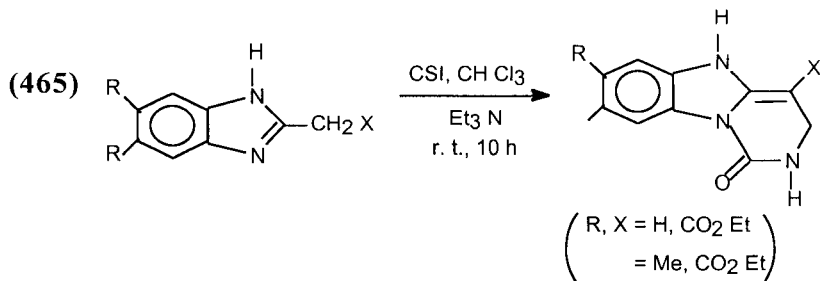
- | | | |
|---------------|---------------------------|--|
| a) 1, 11, 21; | $\text{R}^1 = \text{Me};$ | $\text{R}^2, \text{R}^3 = \text{H}$ |
| b) 2, 12, 22; | $\text{R}^1 = \text{Ph};$ | $\text{R}^2, \text{R}^3 = \text{H}$ |
| c) 3, 13, 23; | $\text{R}^1 = \text{Ph};$ | $\text{R}^2 = \text{H}; \text{R}^3 = \text{p - Me}$ |
| d) 4, 14, 24; | $\text{R}^1 = \text{Ph};$ | $\text{R}^2 = \text{H}; \text{R}^3 = \text{p - Ph CH}_2\text{O}$ |
| e) 5, 15, 25; | $\text{R}^1 = \text{Ph};$ | $\text{R}^2 = \text{H}; \text{R}^3 = \text{p - MeO}$ |

- f) **6, 16, 26;** $R^1 = \text{Ph};$ $R^2 = \text{H}; R^3 = o\text{-Cl}$
 g) **7, 17, 27;** $R^1 = p\text{-MeO C}_6\text{H}_4;$ $R^2, R^3 = \text{H}$
 h) **8, 18, 28;** $R^1 = p\text{-Cl C}_6\text{H}_4;$ $R^2, R^3 = \text{H}$
 i) **9, 19, 29;** $R^1 = p\text{-Me C}_6\text{H}_4;$ $R^2, R^3 = \text{H}$
 j) **10, 20, 30;** $R^1, R^2 = \text{Me}$ $R^3 = \text{H}$

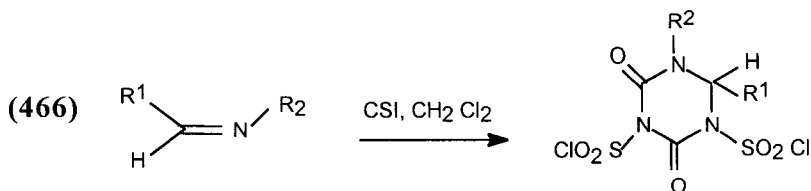
Dhar, D.N., Raghunathan, R., *Ind. J. Chem.*, **23B**, 1187 (1984).



L'Abbe, G., Brems, P., Albrecht, E., *J. Heterocycl. Chem.*, **27**, 1059 (1990).



Badawey, E-S.A.M., Rida, S.M., Soliman, F.S.G., Kappe, T., *J. Heterocycl. Chem.*, **26**, 405 (1989).

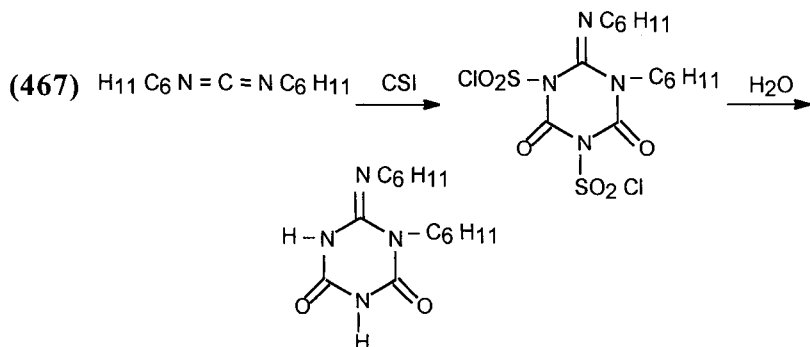
Compounds Containing 


Triazinediones (I)

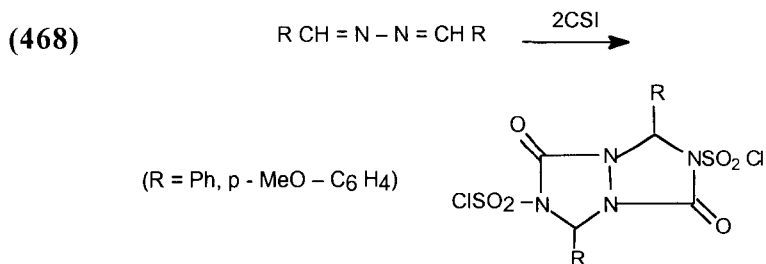
R ¹	R ²	% yield (I)
Ph	Ph	100
p-MeC ₆ H ₄	Ph	86
p-ClC ₆ H ₄	Ph	73
p-NO ₂ C ₆ H ₄	Ph	50
Ph	<i>p</i> -MeOC ₆ H ₄	50
Ph	<i>p</i> -Cl C ₆ H ₄	60
Ph	<i>p</i> -NO ₂ C ₆ H ₄	0
Ph	<i>m</i> -NO ₂ C ₆ H ₄	78
Ph	<i>o</i> -Cl C ₆ H ₄	50
Ph	C ₆ H ₅ CH ₂	60
Ph	C ₆ H ₁₁	65

Walrond, E.R., Suschitzky, H., *JCS Chem. Comm.*, 570 (1973).

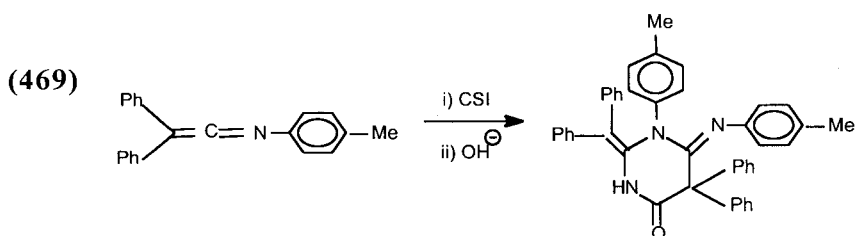
Suschitzky, H., Walrond, E.R. Hull, R., *JCS Perkin Trans. I*, 47 (1977).



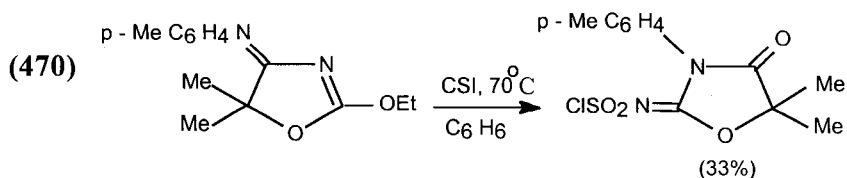
Suschitzky, H., Walrond, E.R., Hull, R., *JCS Perkin Trans. I*, 47 (1977).



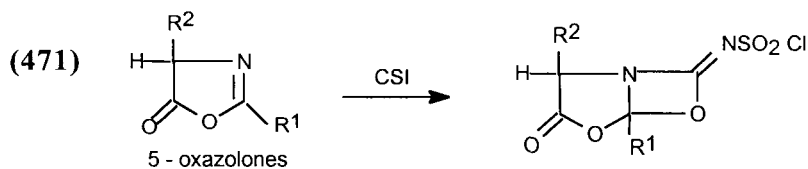
Walrond, E.R., Suschitzky, H., *JCS Chem. Comm.*, 570 (1973).



Naser - ud - din, Riegl, J., Skatteboel, L., *JCS Chem. Comm.*, 570, (1973).

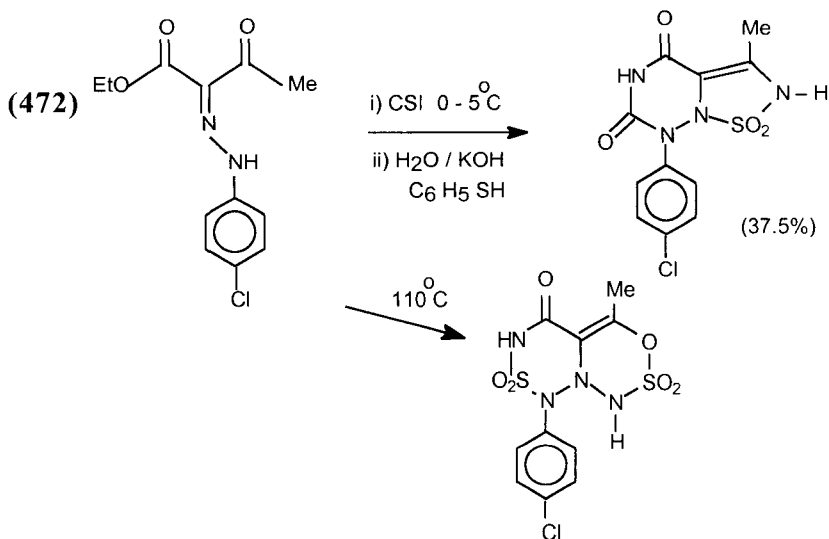


L'Abbe', G., Destexhe, R., *JCS Chem. Comm.*, (22) 1614 (1985).

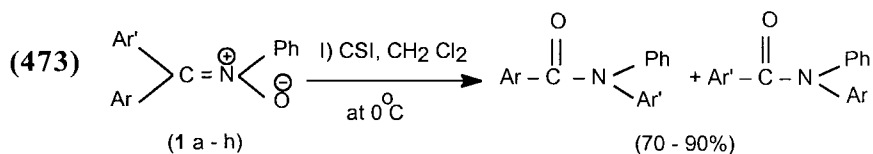


- a) R¹ = Ph; R² = Me
 b) R¹ = Ph; R² = PhCH₂
 c) R¹ = Me; R² = PhCH₂

Dhar, D.N. and Raghunathan, R., *Ind. J. Chem.*, 23B, 761 (1984).



Daniel, J., Dhar, D.N., *Heterocycles*, **32**, 1517 (1991).



1a Ar, Ar¹ = Ph

1b = 4 - Me C₆ H₄;

1c = 4 - MeO C₆ H₄;

1d = 4 - Cl - C₆ H₄;

1e = 4 - NO₂ - C₆ H₄;

1f = 4 - NO₂ C₆ H₄;

1g = 4 - NO₂ C₆ H₄;

1h = Ph

Ar', = 4 - Me C₆ H₄

= 4 - MeO C₆ H₄

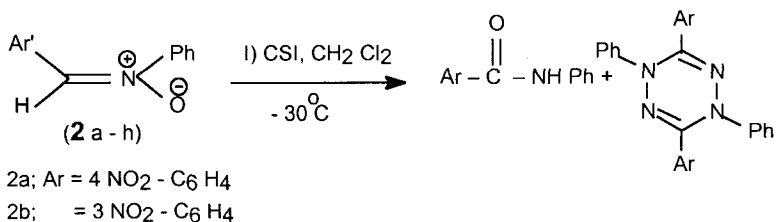
= 4 Cl - C₆ H₄

= 4 - Me C₆ H₄

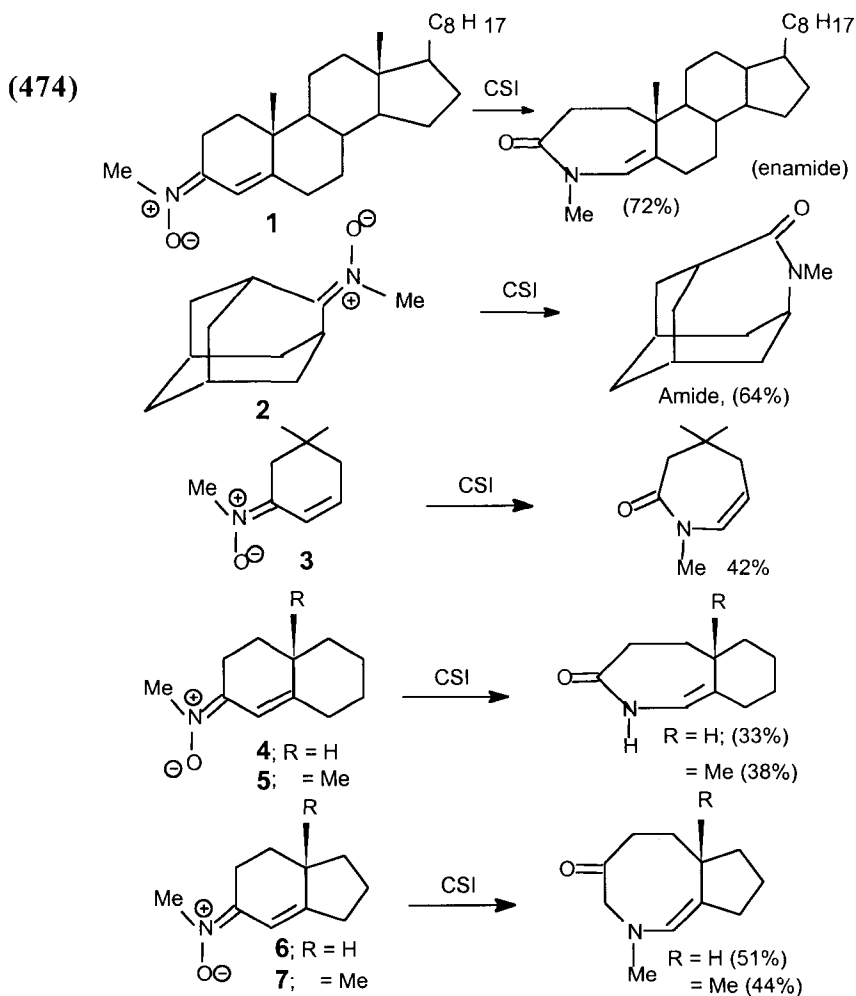
= 4 - MeO C₆ H₄

= 4 - Cl - C₆ H₄

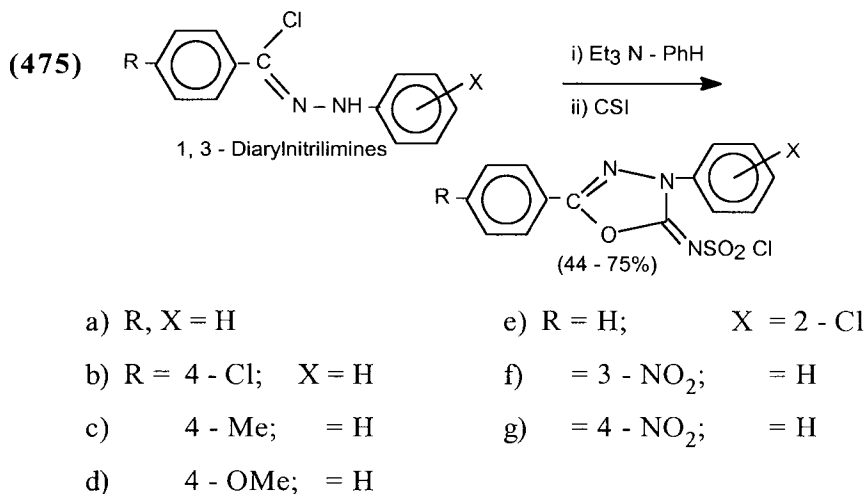
= 4 - NO₂ - C₆ H₄



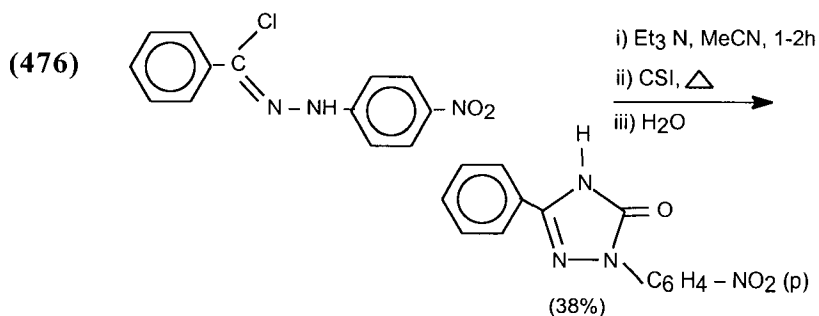
Joseph, S.P., Dhar, D.N., *Tetrahedron*, **42**, 5979 (1986).



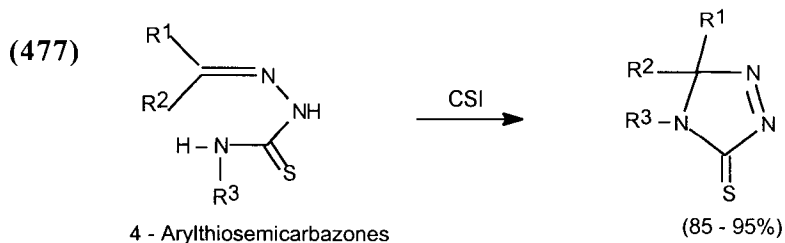
Joseph, S.P., Dhar, D.N., *Tetrahedron*, **44**, 5209 (1988).



Dhar, D.N. and Raghunathan, R., *Synthesis*, 1095, (1982).

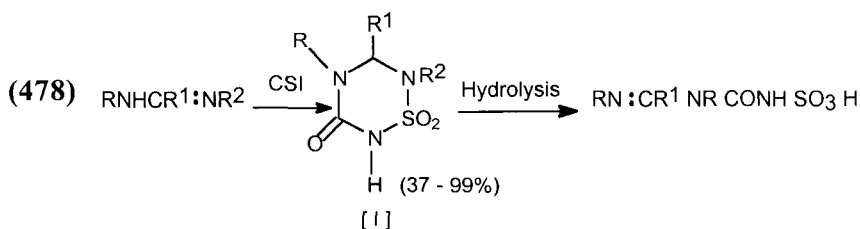


Dhar, D.N. and Raghunathan, R., *Synthesis*, 1095, (1982).



- a) $R^1, R^2 = \text{Me}, R^3 = \text{Ph}$ f) $R^1, R^2 = \text{Me}; R^3 = p\text{-Cl C}_6\text{H}_4$;
 b) $R^1, \text{Me}, R^2 = \text{Et}, R^3 = \text{Ph}$ g) $R^1 = \text{Me}; R^2 = \text{Et}, R^3 = p\text{-Cl C}_6\text{H}_4$
 c) $R^1, R^2 = \text{-(CH}_2\text{)}_5$; $R^3 = \text{Ph}$; h) $R^1, R^2 = \text{-(CH}_2\text{)}_5$; $R^3 = p\text{-Cl C}_6\text{H}_4$
 d) $R^1, R^2 = \text{-(CH}_2\text{)}_4$; $R^3 = \text{Ph}$; i) $R^1, R^2 = \text{-(CH}_2\text{)}_4$; $R^3 = p\text{-Cl C}_6\text{H}_4$
 e) $R^1, R^2 = \text{Et}; R^3 = \text{Ph}$; j) $R^1, R^2 = \text{Et}; R^3 = p\text{-Cl C}_6\text{H}_4$

Tripathi, M., Dhar, D.N., *Synthesis*, 1095, (1982).



$R^1, R^2 = \text{Me}; R^1 = \text{H, Me, Ph}$

$R, R^2 = \text{Ph}$;

$R, R^2 = \text{Me}; 4\text{-MeO C}_6\text{H}_4; R^1 = \text{Ph}$

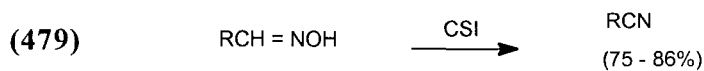
$R, R^2 = 4\text{-MeO C}_6\text{H}_4$

$R = \text{Me. } R^1, R^2 = \text{Ph}$

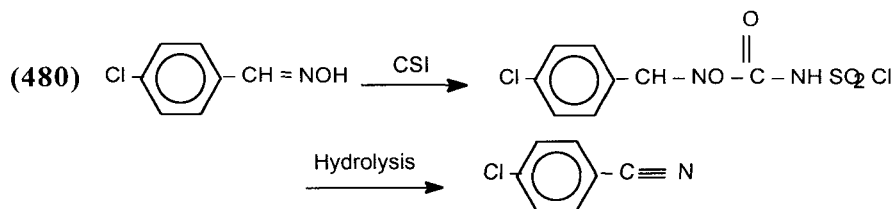
$R^1 = \text{Me}$

[I] = 1, 2, 4, 6 - Thiatriazin-5 - olate, 1, 1 - dioxide

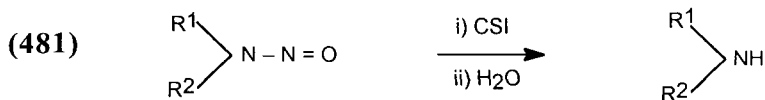
Friedrichsen, W., Moeckel, G., Debaerdemaeker, T., *Heterocycles*, **22**, 63 (1984).



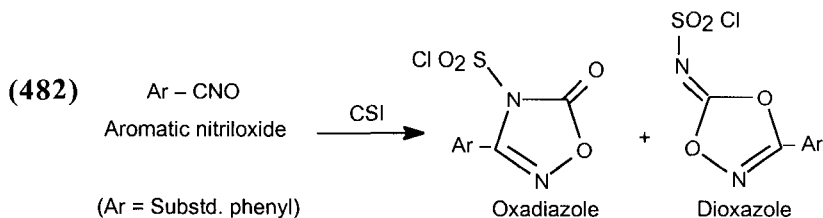
Olah, G.A., Vankar, Y.D., Garcia - luna, A., *Synthesis*, 227 (1979).



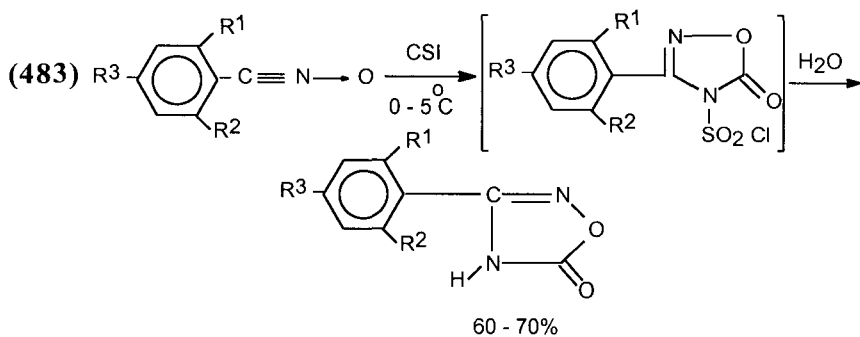
Gerwalt, Z., Helga, R., *Chem. Ztg.*, **96**, 287 ((1972).

Compounds Containing $-N=O; \equiv N \rightarrow O$ 

Dhar, D.N., Bag, A.K., *Ind. J. Chem.*, **22B**, 600 (1983).

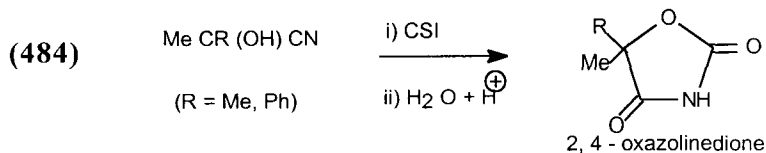


Esipenko, A.A., Fetyukhin, V.N., Kramarenko, F.G., Chernega, A.N., Samarai, L.I., Pirenzhenkov, V.V., *Zh. Org. Khim.*, **27**, 1262 (1991). C.A. **117**, 26439 (1992).

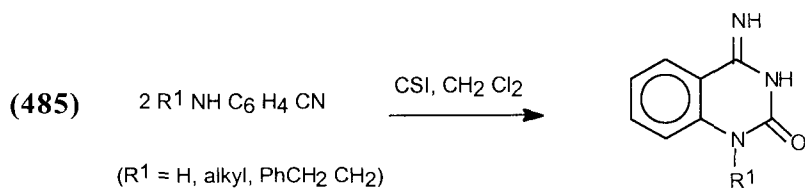


Rao, K.R., Srinivasan, T.N., Sattur, P.B., *Heterocycles*, **27**, 683 (1988).

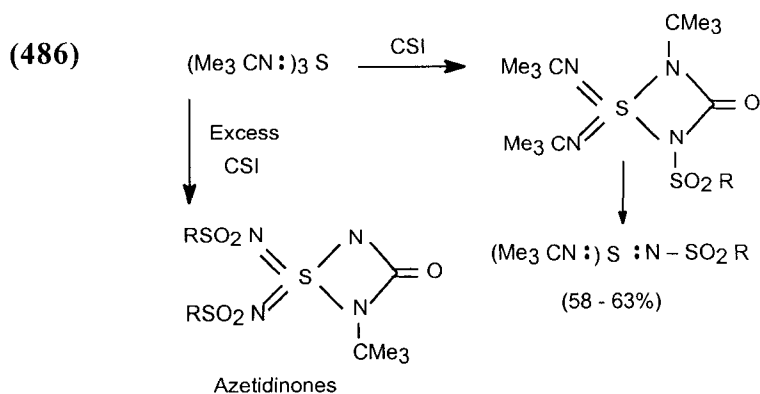
Cyanides



Garcia, M.V., Menendez, J.C., Villacampa, M., Sollhuber, M.M., *Synthesis*, 6978 (1991).

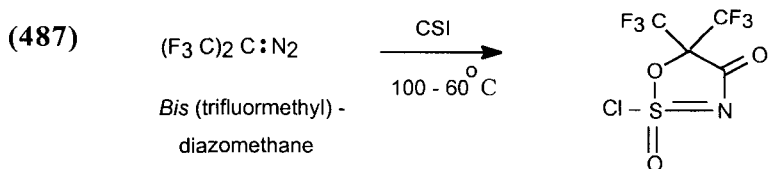


Reddy, A.V.N., Kamal, A., Sattur, P.B., *Synthetic, Comm.*, **18**, 525 (1988).

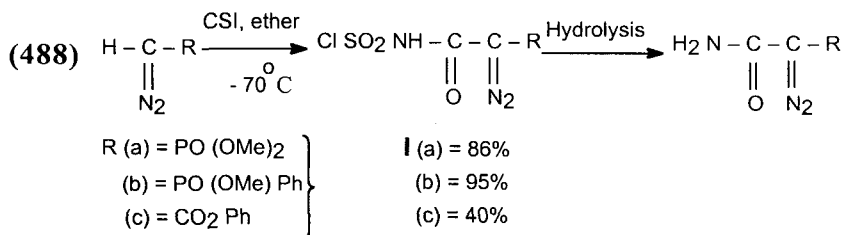


Tesky, F.M., Mews, R., Krebs, B., Udupa, M.R., *Angew. Chem.*, **90**, 722 (1978).

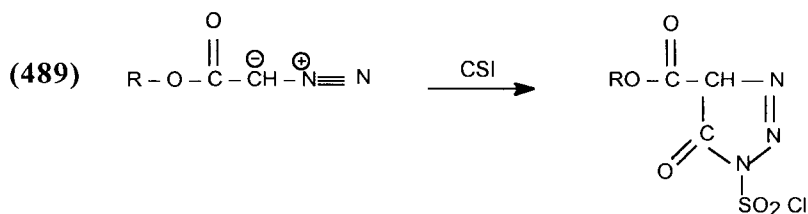
Diazo, Azido Compounds



Steinbeisser, H., Mews, R., Glemser, D., *Z. Anorg. Allg. Chem.*, **406**, 299 (1974).

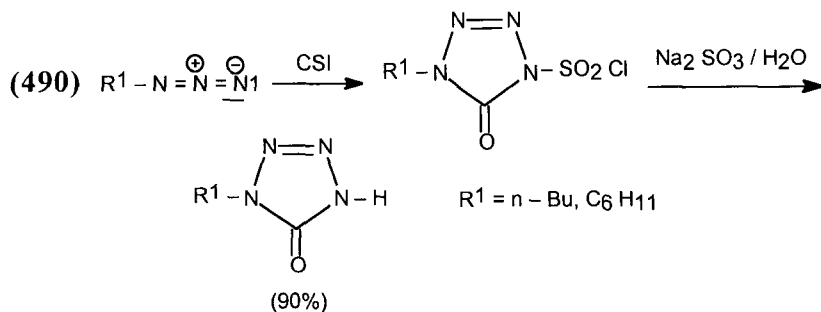


Regitz, M. Weber, B, Heydt. A., *Ann.*, **305**, 323 (1980).



Biener, H., Farbwerke Hoechst, A.G., unpublished results

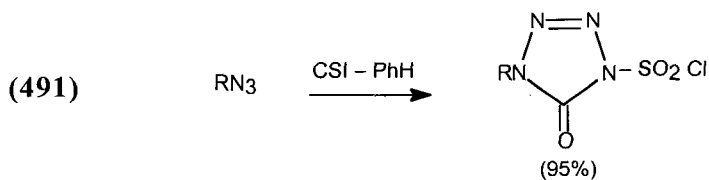
Graf, R., *Angew. Chem. Int. Ed. Engl.*, **7**, 172 (1968).



Suschitzky, H; Walrond, E.R., Hull, R., *JCS Chem. Comm.*, **16**, 570 (1973).

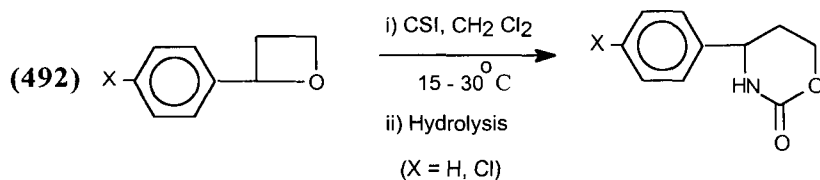
Suschitzky, H., Walrond, E.R., Hull, R., *JCS Perkin Trans. I*, 47 (1977).

Moriconi, E.J., Datta, C.P., *JOC*, **35**, 2448 (1970).

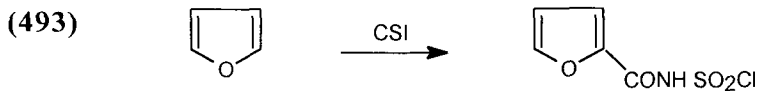


Vander Sarel, J-M., Smets, G., L'Abbe, G., *JOC*, **38**, 675 (1973).

Oxygen Heterocycles

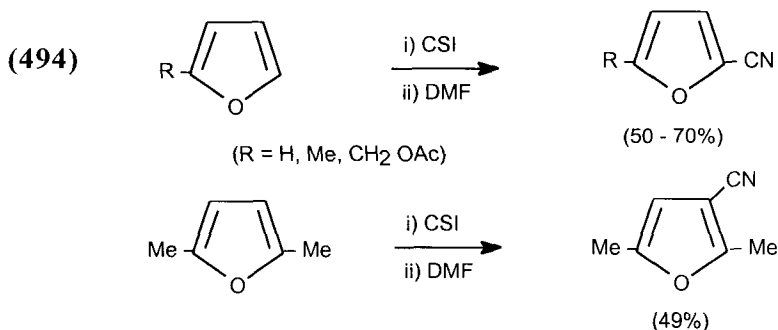


Sampath Kumar, E., Dhar, D.N., *Synth. Comm.*, **25**, 1939 (1995).

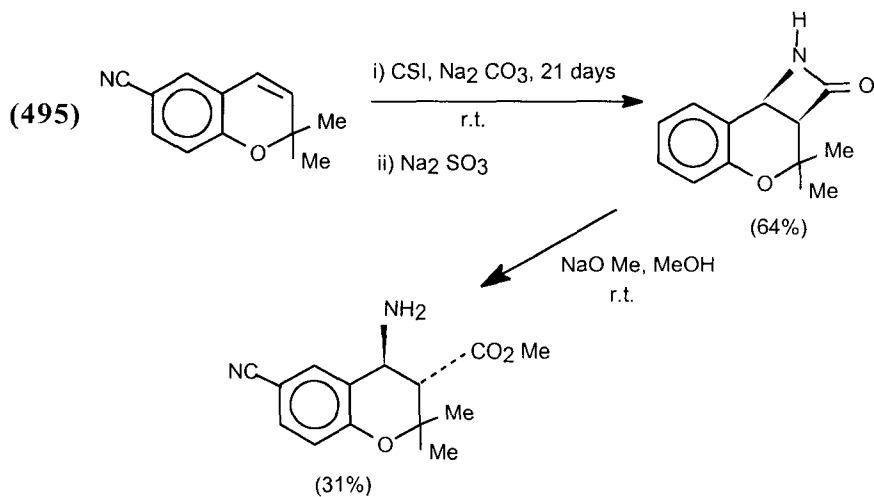


Graf, R., *Ann.*, **661**, 111 (1963).

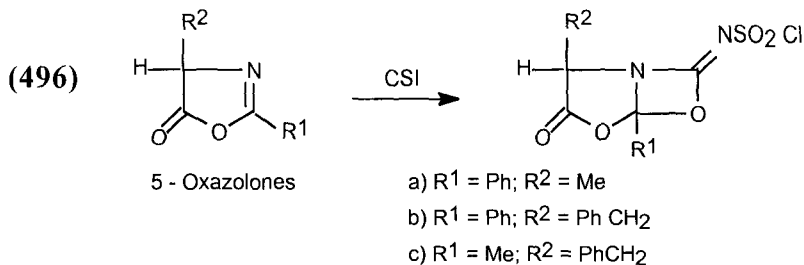
Graf, R., German Patent, 941,487, *C. A.*, **51**, 14789 (1957).



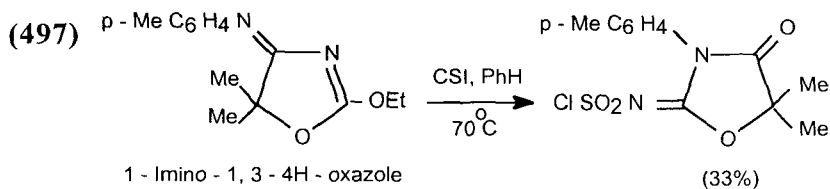
Floyd, A.J., Kinsman, R.G., Roshan, A.Y., Brown, D.W., *Tetrahedron*, **39**, 3881 (1983).



Buckle, D.R., Houge - Frydrych, C.S.V., Pinto, I.L., Smith, D.G., *JCS Perkin Trans.*, I, 63 (1991).

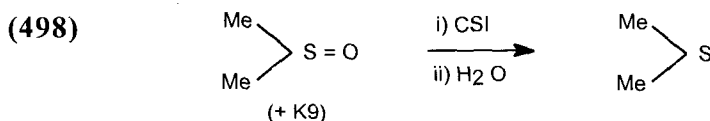


Dhar, D.N., Raghunathan, R., *Ind. J. Chem.*, **23B**, 761 (1984).

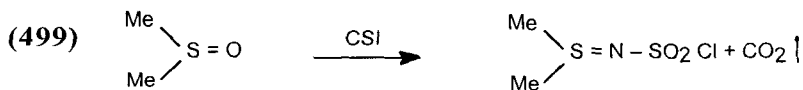


L'Abbe', G., Destexhe, R., *JCS Chem. Comm.*, 1614 (1985).

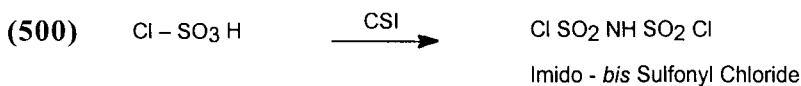
Sulfur Containing Compounds



Keshava Murthy, K.S., Vankar, Y.D., Dhar, D.N., *Ind. J. Chem.*, **22B**, 504 (1983).



Appel, R., Rittersbacher, H., *Chem. Ber.*, **97**, 852 (1964).

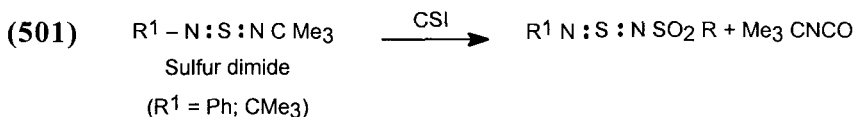


Appel, R., Eisenhauer, G., *Ber.* **95**, 1753 (1962).

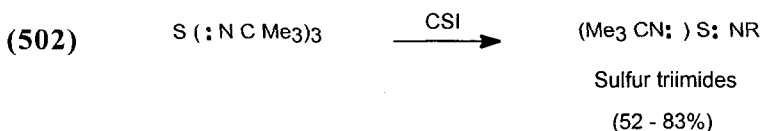
Ali, F.E., Krell, R.D., Snader, K.M., *Eur. Pat. Appl.* EP 34462 (1981),
C.A. **96**, 34857 (1982).

Ali, F.E., *Eur., Pat. Appl.* EP 38177 (1981), C.A. **96**, 68845 (1982).

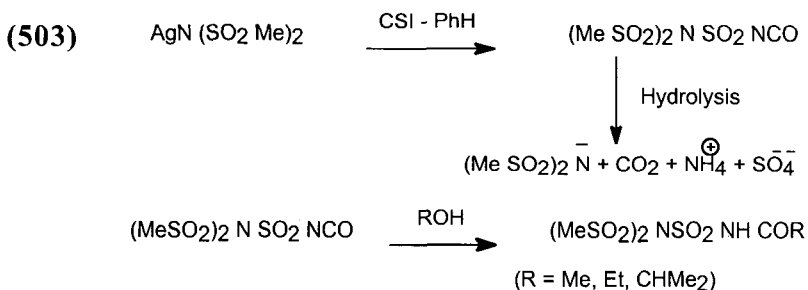
Gleason, J.G., *Eur. Pat. Appl.* EP 40990 (1981), C.A. **96**, 142723 (1982).



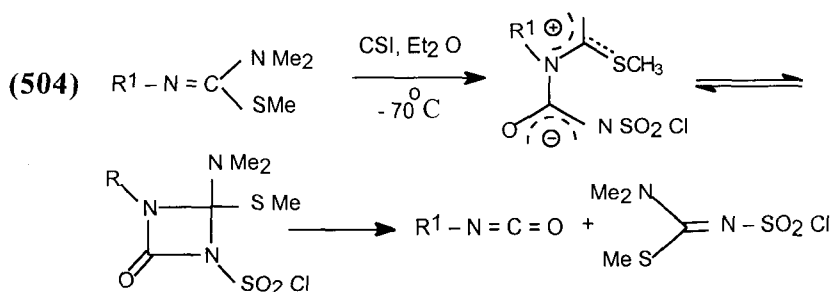
Appel, R., Montenash, M., *Chem. Ber.*, **109**, 2437 (1976).



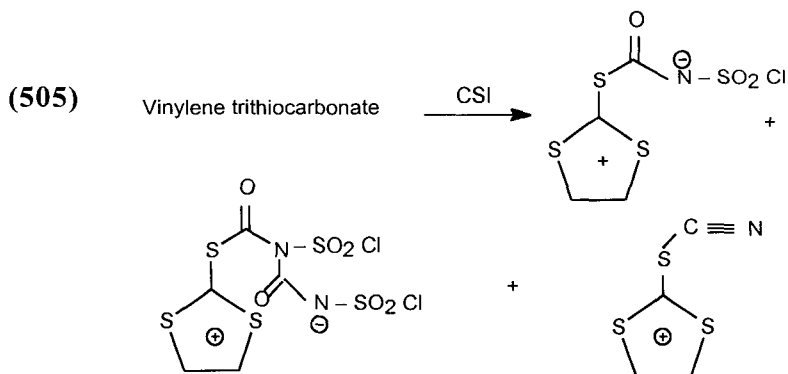
Tesky, F-M, Mews, R., *Chem. Ber.*, **113**, 2183 (1980).



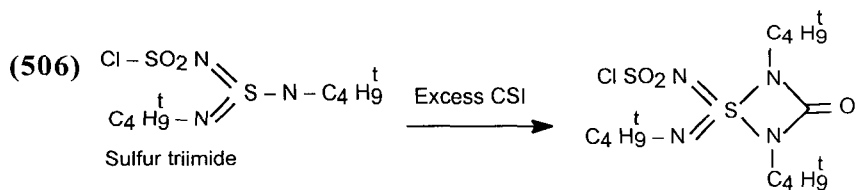
Blaschette, A., Dalluhn, J., Proehl, H.H., Jones, P.G., Bubenitschek, P.,
Phosphorus, Sulfur, silicon related Elements, **70**, 91 (1992).



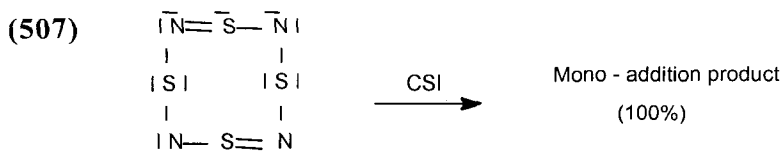
Schaumann, E., Kousch, E., Imbert, J.P., *Chem. Ber.*, **111**, 1475 (1978).



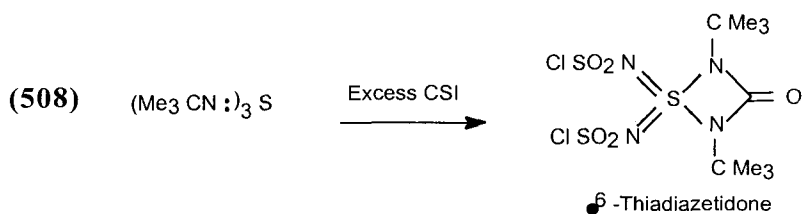
Pajouhesh, H., Mahkam, M., *J. Sci. Islamic Repub. Iran*, **7**, 169 (1996); *C.A.*, **125**, 328618 (1996).



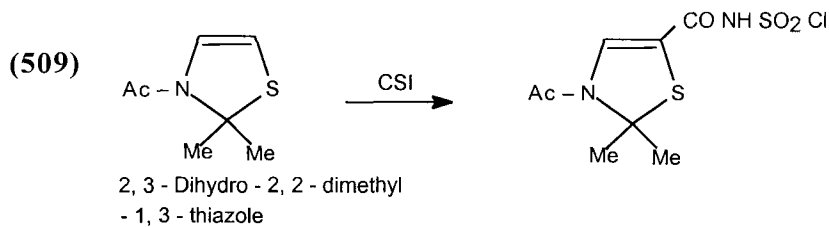
Tesky, F.M., Mews, R., *Chem. Ber.*, **113**, 2434 (1980).



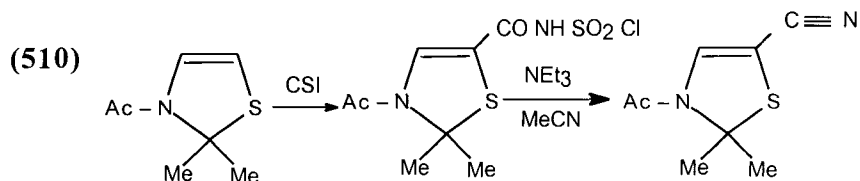
Appel, R., Montenash, M., Ruppert, I., *Chem. Ber.*, **108**, 582 (1975).



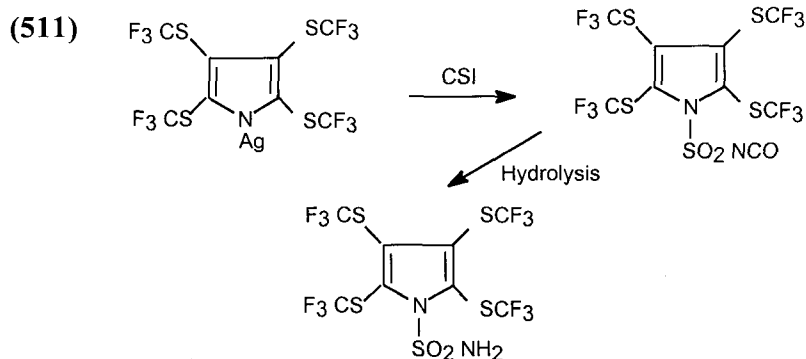
Tesky, F.M., Mews, R., *Chem. Ber.*, **113**, 2434 (1980).



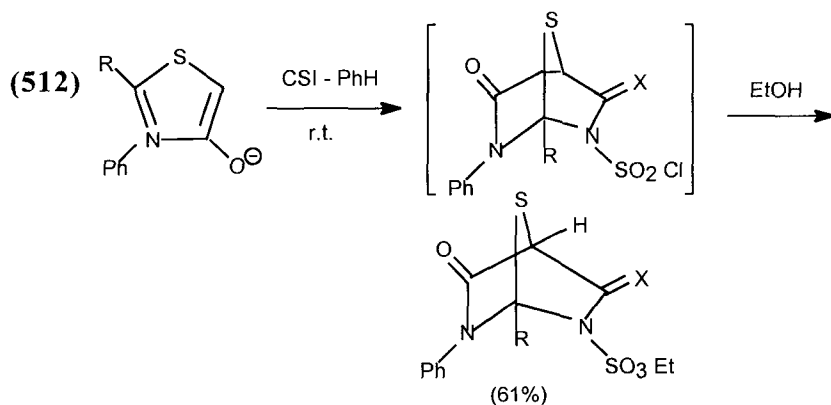
Vorbruggen, H., *Helv. Chim. Acta*, **74**, 297 (1991).



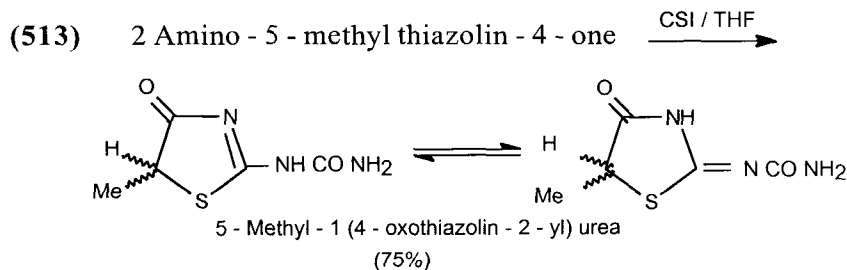
Vorbruggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



Reich, K., (Teroson G.m.b.H.) Ger. offen. DE 3,235,045., C.A. **101**, 38216^s (1984).

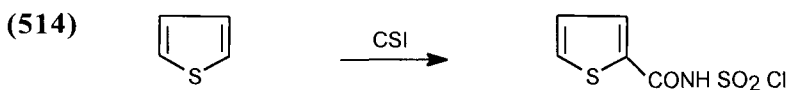


Potts, K.T., Baum, J., Datta, S.K., Hughton, E., *JOC*, **4**, 813 (1976).



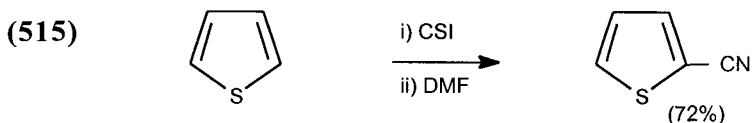
Hurst, D.T., Stacey, A.D., Nethercleft, M., Rahim, A., Harnden, M.R., *Aus. J. Chem.*, **41**, 1221 (1988).

Sulfur Heterocycles

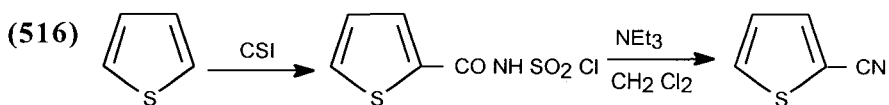


Graf, R., *Ann.* **661**, 111 (1963)

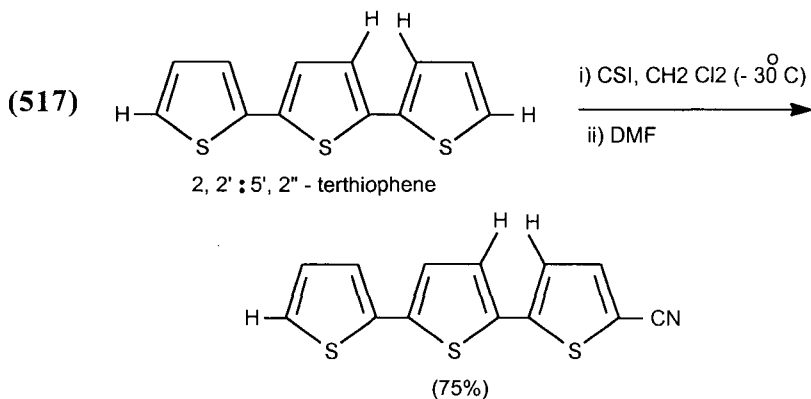
Graf, R., Ger. Patent, 941,847., C.A. **51**, 14789 (1957).



Gronowitz, S., Liljefors, S., *Acta Chem. Scand.*, **31B**, 771 (1977).

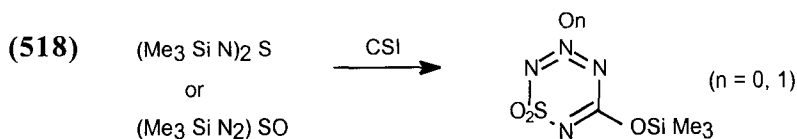


Vorbruggen, H., Krolkiewicz, K., *Tetrahedron*, **50**, 6549 (1994).



Soucy - Breau, C., Mac Eachern, A., Leitch, L.C., Arnason, T., Morand, P., *J. Heterocycl. Chem.*, **28**, 411 (1991).

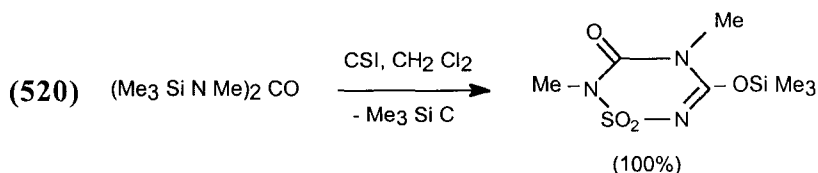
Organo-Silicon Compounds



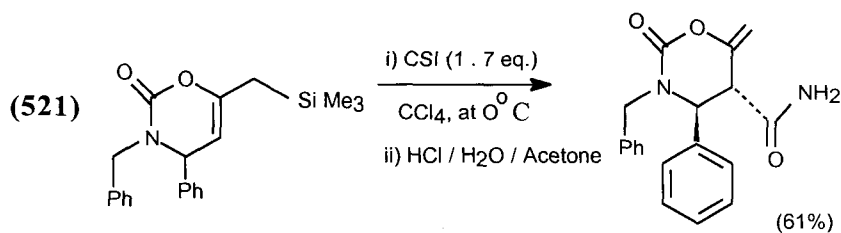
Appel, R., Vhlenhaut, H., Montenash, M., *Z. Naturforsch., Teil B*, **29**, 799 (1974).



Buss, W., Kaannich, H.J., Sundermeyer, W., *Chem. Ber.*, **109**, 1486 (1976).

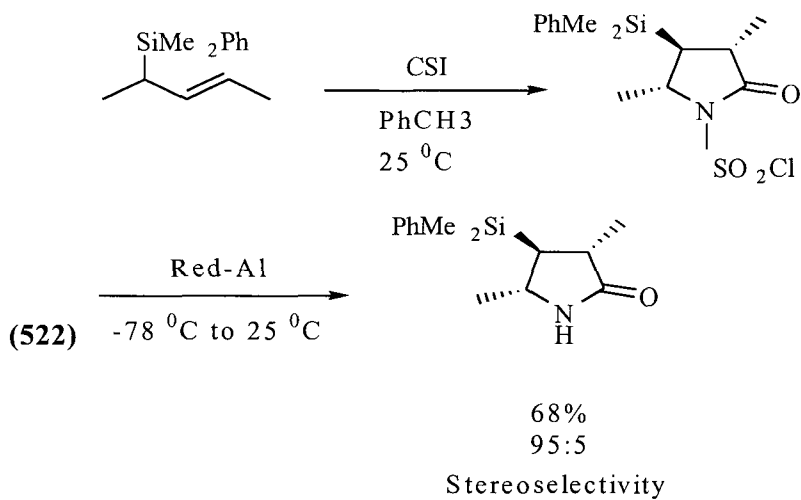


Barton, T.J., Rogido, R.J., *JCS Chem. Comm.*, 878 (1972).

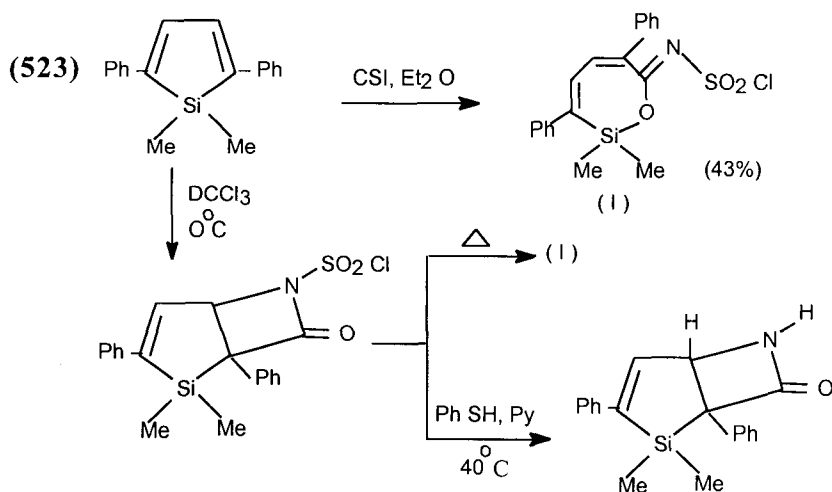


3-Benzyl - 4 - phenyl - 6 - (trimethylsilyl methyl)
-3, 4- dihydro - 2H - 1, 3- Oxazine - 2 - one

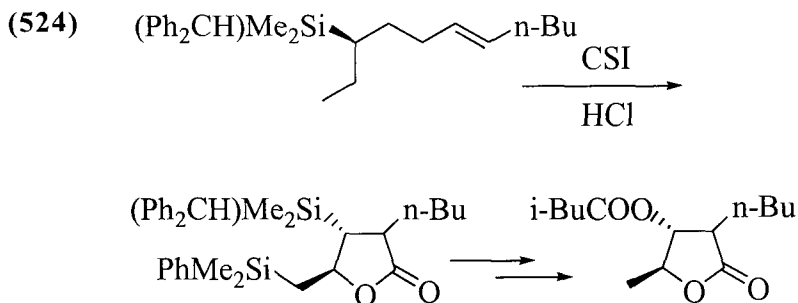
Esch, P.M., Hiemstra, H., Speckamp, W.C., *Tetrahedron*, **48**, 3445 (1992).



Roberson C., Woerpel, K., *JOC*, **64**, 1434 (1999).

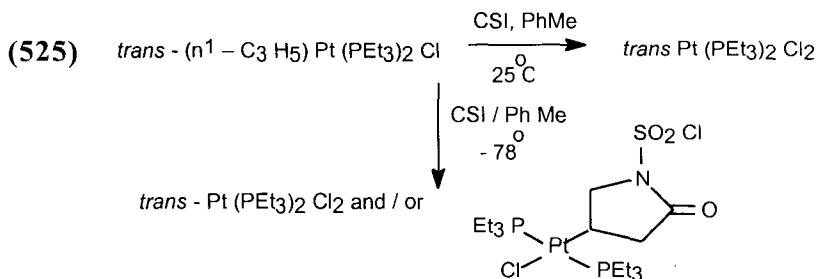


Barton, J.T., Rogido, J.R., *JOC*, **40**, 582 (1975).

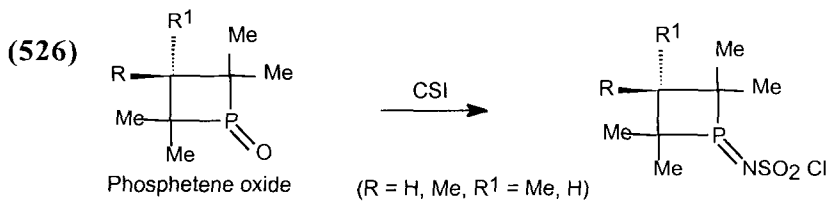


Peng, Z., Woerpel, K., *Org. Lett.*, **3**, 675 (2000)

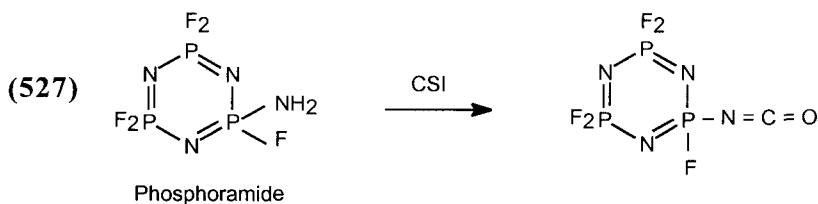
Organo-Phosphorus Compounds



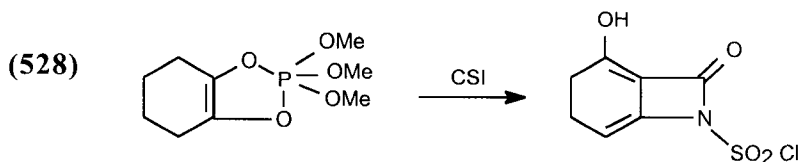
Hu, Y.R., Wojcicki, A., Calligaris, M., Nardin, G., *Organometallics*, **6**, 1561 (1987).



Hall, C.R., Smith, D.J.H., *JCS Perkin Trans.*, **2**, 1373 (1977).



Roesky, H.W., Janssen, E., *Z. Naturforsch.*, Teil B, **29**, 174 (1974).

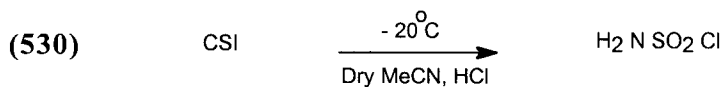


Neidlen, R., Mosebach, R., *Arch. Pharm.* **309**, 724 (1976).

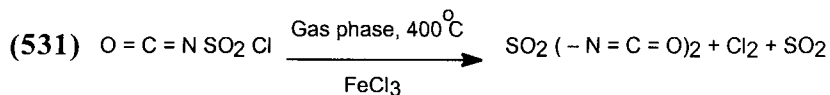
Miscellaneous Reactions



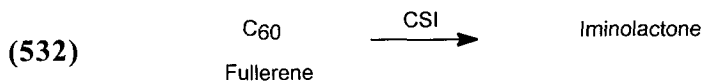
Hahn, H., German Patent, 1,083791., C.A. **55**, 17509 (1961).



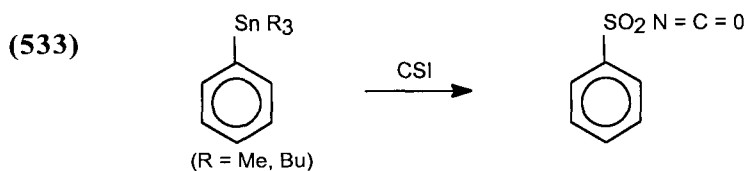
Peterson, E.M., Brownell, J., Vince, R., *J. Med. Chem.*, **35**, 3999 (1992).



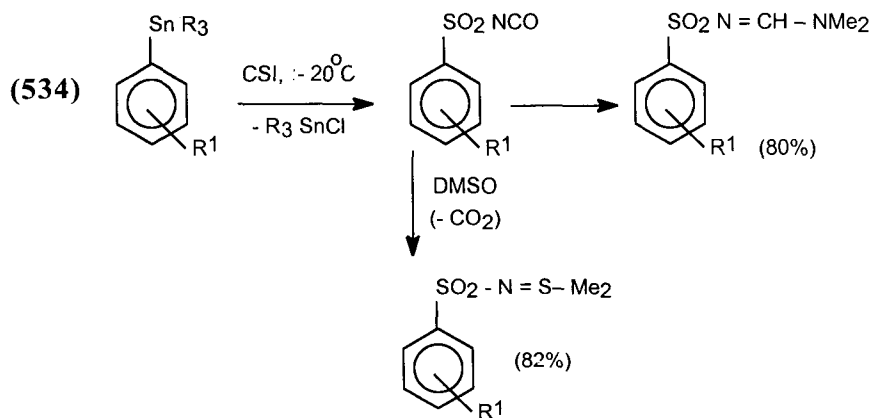
Matterstock, K., Graf, R., (Farbwerke Hoechst A.G.), German Patent, 1152093, (1961); *Chem. Zbl.*, 14-1957 (1964).



Muthu, S., Maruthamuthu, P., *Fullerene Sci. Technol.*, **4**, 1066 (1996)., C.A. **125**, 300804 (1996).



Arnsward, M., Neumann, W.P., *Chem. Ber.*, **124**, 1997 (1991).



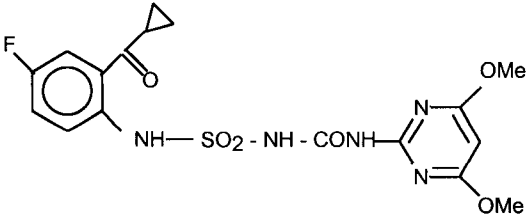
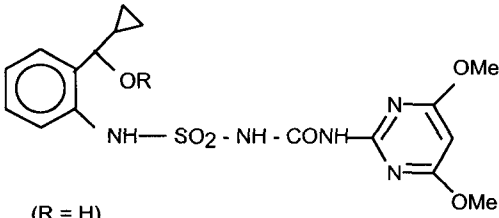
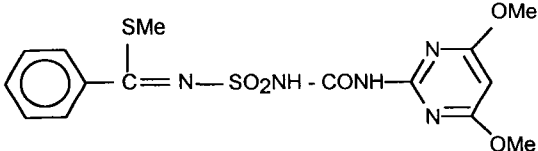
Arnsward, M., Neumann, W.P., *JOC*, **58**, 7022 (1993).

This page is intentionally left blank

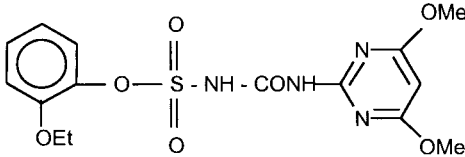
Part II
CSI Applications

This page is intentionally left blank

II-1 Herbicides, Plant Growth Regulators/ Inhibitors and Plant Protection Agents

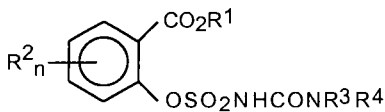
General Name and Structure of Compound	Applications	Ref.
<ul style="list-style-type: none"> 1-[2-(Cyclopropylcarbonyl) 4 - fluorophenyl-Sulfamoyl] - 3 - [4, 6 - dimethoxy -2- pyrimidinyl] urea 	Herbicides	1
<ul style="list-style-type: none"> 1 - α - Cyclopropyl - α - (subs.) - hydroxy - o - tolyl-sulfamoyl - 3 - (4, 6 - dimethoxy - 2 - pyrimidinyl) ureas 		
Example compound:		
 <p>(R = H)</p>	Herbicides	2
<ul style="list-style-type: none"> Pyrimidinyl ureas 		
	Herbicides	3

- N-Sulfonyl -N¹- (2- pyrimidinyl / or 2-triazinyl) ureas



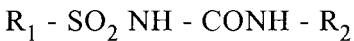
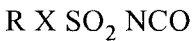
Herbicides 4

- Pyrimidinyl (and triazinyl) ureidosulfonyloxybenzoates

(R⁴ = Pyrimidinyl/triazinyl)

Herbicides 5

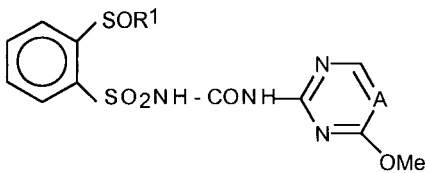
- Sulfonylisocyanate



As an intermediate for the preparation of herbicidal sulfonylureas.

6

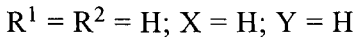
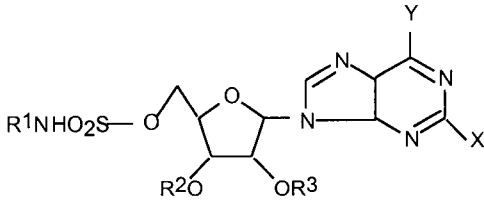
- N - azinyl - N¹ - (2-alkylsulfinylbenzenesulfonyl) urea



A = CH/N

Herbicides 7

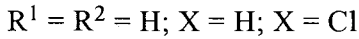
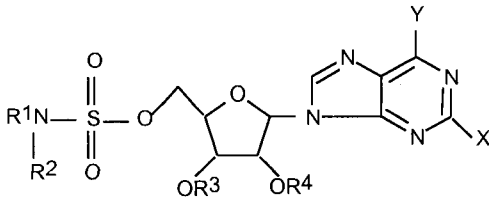
- Purine derivatives



Herbicides

8

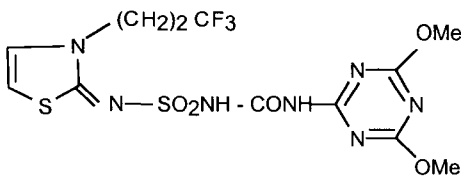
- Adenosine herbicides



Herbicides

9

- Trifluoropropylthiazoline - moiety containing triazine derivatives

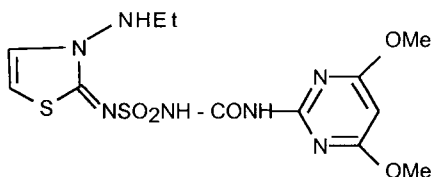


Herbicides

10

- Pyrimidinyl urea derivatives

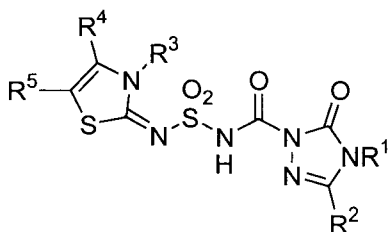
Example compound:



Herbicides

11

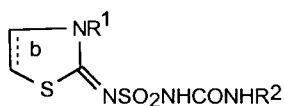
- Thiazol(in)ylideneaminosulfonyl amino(thio) triazolinones



Herbicides

12

- Thiazolylimino sulfonyl urea derivatives



Herbicides

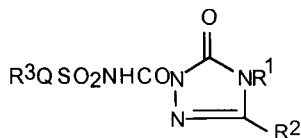
13

R¹ = alkyl, alkenyl, alkynyl

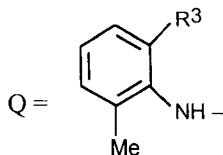
R² = subs. pyrimidinyl, triazinyl

bond b = satd. or unsatd.

- Sulfonylaminocarbonyl triazolinones



Example compound:

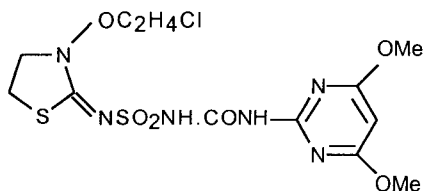


$R^1 = \text{Me}$

$R^2 = \text{OEt}$

$R^3 = \text{CO}_2 \text{ Et}$

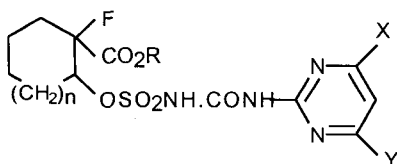
- N-(2-Chloroethoxy) thiazolidine derivatives



Herbicides

14

- Ureidopyrimidine derivatives



Herbicides

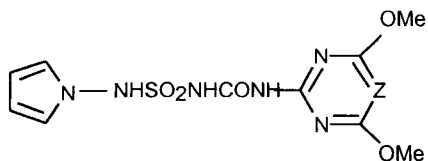
16

R = alkyl

X, Y = halo, alkyl etc.

n = 0 or 1.

- [Pyrrolylamino) sulfonyl] ureido-] - azines

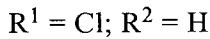
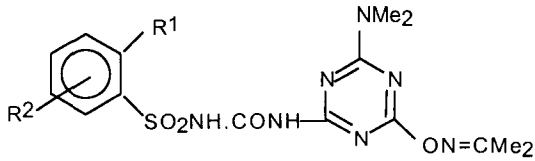


Herbicides

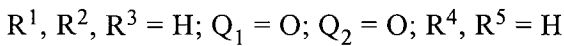
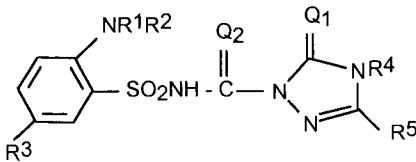
17

(Z = CH/N)

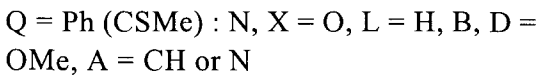
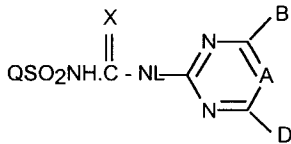
- Phenylsulfonyl ureidotriazoles



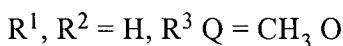
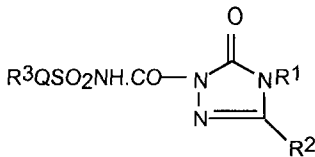
- Substituted arylsulfonylamino (thio) carbonyl triazolin (thi) ones



- Pyrimidinyl and triazinylurea derivatives



- Sulfonylaminocarbonyl triazolinones



Applications
in agriculture,
increases the
leaf length
of corn.

18

Herbicides

(For the control
of Cyprus, Setaria,
Solanum, Xanthium,
Echinochloa etc.)

19

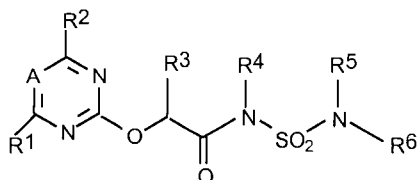
Herbicides

20

Herbicides

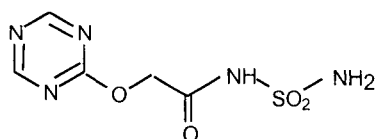
21

- Pyrimidine - triazine containing sulfamides

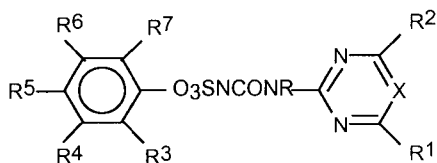


$R^1, R^2, R^3, R^4, R^5, R^6 = H$

Example compound:

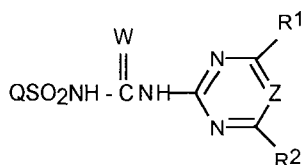


- N-(Heterocyclicaminocarbonyl) arylsulfamate



$R = H; R^1, R^2 = Me; R^3 - R^7 = H; X = N$

- Heteroaryl aryl sulfonyl ureas



Q = (Un) substd. condensed hetero-aryl having a bridge head nitrogen

W = O; $R^1, R^2 = Me; Z = N$

Herbicides

22

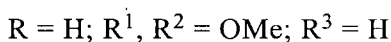
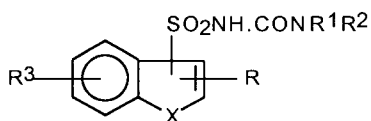
Herbicide

23

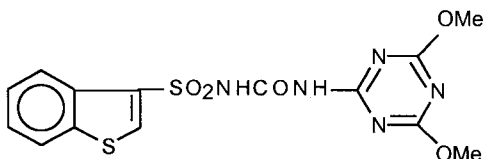
Herbicide

24

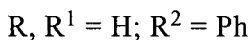
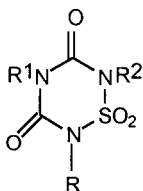
- Benzothiophene/and benzofuran sulfonamides



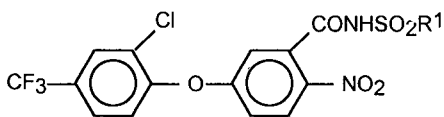
Example compound:



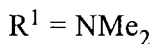
- 3,4,5,6 - Tetrahydro -1,2,4,6 - thiaziazine -3,5 - dione 1,1 - dioxides



- Phenoxybenzoic acid derivatives



Example compound:



Herbicides -
total control
over cocklebur
and morning
glory.

25

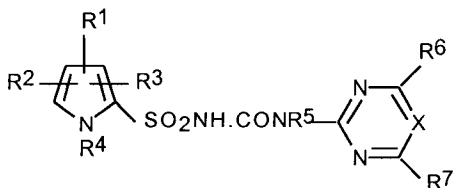
Herbicides -
useful in
controlling
undesirable
plant growth.

26

Heribicidal
activity - 100%
control of
Eschinochloa
crusgali

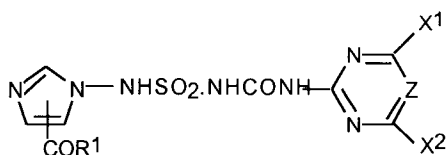
27

- Sulfonamides



I : $R^1 - R^5 = H$; $R^6, R^7 = Me$; $X = CH$

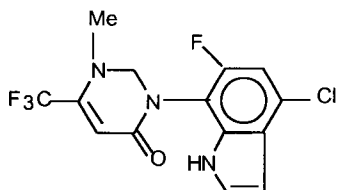
- 1- [(Azinylureylene) sulfonylamino] imidazoles



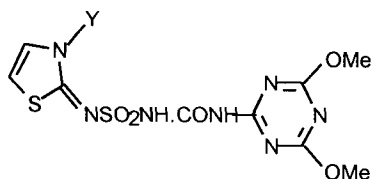
Example compound (I)

$X^1, X^2 = OMe$; $COR^1 = 5 Ac$.

- Indolyl Substituted uracil derivatives



- Fluoropropylthiazoline derivatives



$Y = (CH_2)_2 F$

Herbicidal activity

Compound I completely controlled nutsedge in pre-emergence applications.

28

As Herbicides.

Compound (I)

completely controlled weeds e.g.

Digitaria

adscendens,

Stelloria neglecta,

Setaria, viridis etc. 29

Herbicides - Gave

more than 90%

control of

Echinochloa

oryzicola, Monochoria

vaginalis, Scirpus

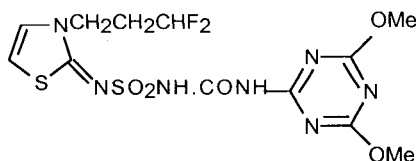
juncoides.

30

Useful herbicides

31

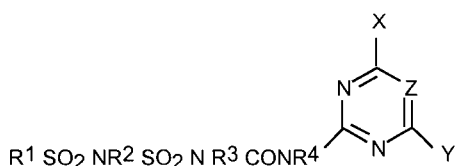
- Difluoropropylthiazoline derivatives



Pre - emergence -
Herbicide (90%
herbicidal effect
for *Avena fatua*,
Stellaria media,
Amaranthus
viridis).

32

- Cycloalkylsulfonylamino sulfonyl ureidoazines



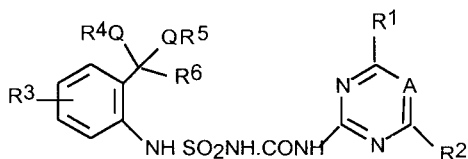
Example Compound:

$R^1 = \triangle$, $R^2 = \text{Me}$; $R^3, R^4 = \text{H}$; $X, Y = \text{OMe}$,
 $Z = \text{CH}$

Herbicides
(strong activity
against weeds).

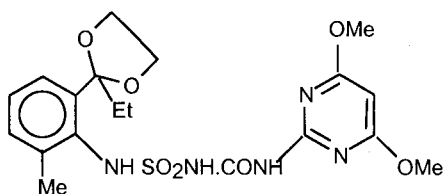
33

- Phenylaminosulfonyl ureidoazines



(I)

Example compound:



(II)

Herbicides -
(II) Showed
strong
herbicidal
activity
but was well
tolerated by
cotton.

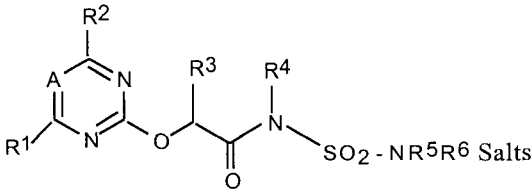
34

- Sulfonylureas with fused heterocyclic moiety

1-Heterocyclysulfonyl - 3 - (4, 6 - dimethoxy-pyrimidine - 2 - yl) ureas

Herbicidal activity 35

- Sulfonamide

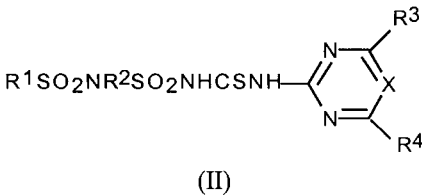
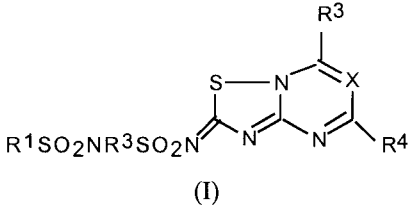


Herbicides 36

Example compound:

R¹, R² = Me; R³ = - C (CH₃)₃; R⁴ = H; R⁵ = H; R⁶ = Me

- Thiadiazalopyrimidines and sulfonylthioureido - pyrimidines

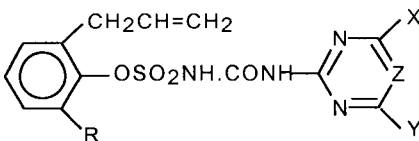


Example compound gave > 90% control of *Cyperus microisia*, *Rorippa indica* and no damage to wheat, soyabean and corn crops. 37

Example compound:

(II) R¹, R² = Me; R³, R⁴ = OMe; X = CH

- 2-Alkylphenyl sulfamates

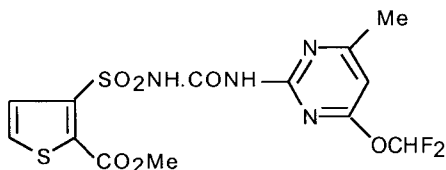


Example compound is an effective herbicide and does not cause any damage to rice. 38

Example compound:

R = H; X, Y = MeO; Z = H

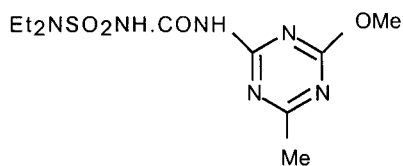
- N - Heterocyclosulfonyl - N' - Pyrimidinyl triazinyl ureas



Herbicide (total control of *Stellaria* and *Digitaria*)

39

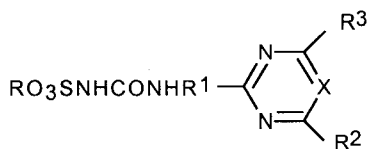
- Sulfonamides



Herbicides

40

- Arylsulfamates



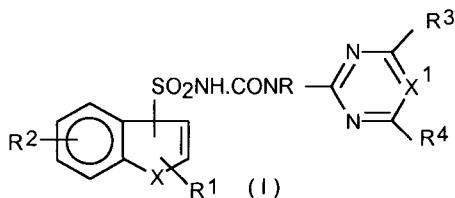
Herbicides

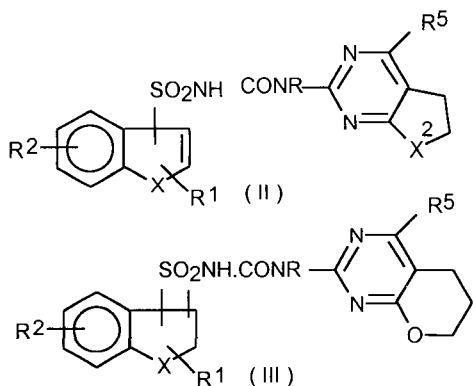
41

(X = CH; N) Example compound:

R = Ph; R1 = H; R2 = Me; R3 = OMe

- Herbicidal benzothiophene and benzofuran sulfonamides





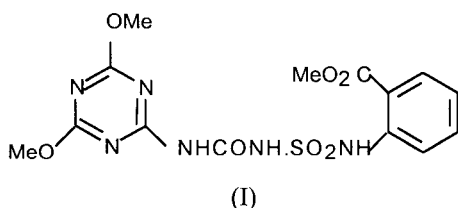
Example compound (I) in rice cultures inhibited barnyard grass and water chestnut with small effect on the rice plants.

42

Example compound:

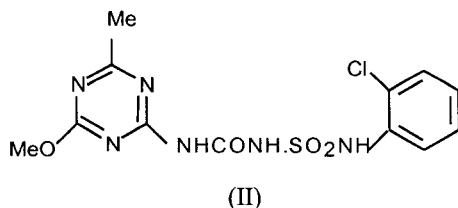
(I) $R = R^2 = H$; $R^1 = 2 - CO_2 Me$; $R^3 = Me$; $R^4 = MeO$; $X = S$; $X^1 = CH$

• Triazo compounds



Herbicidal activity

43



• Lepidopterical Isothiourea compound

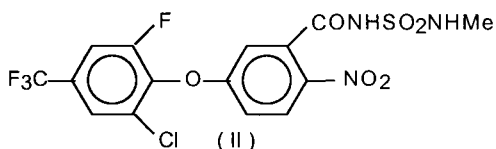
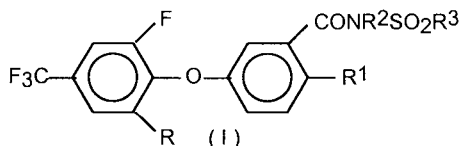
$RN : C (SR^2) NR^1 CONR^3 R^4$

$R^1, R^2 = C_{2-10}$ alkyl; $R + R^1$ contain 12-22 C; $R^2 = C_{1-4}$ alkyl, C_{3-10} alkenyl, C_{3-4} alkynyl, $R^3 = H$, C_{1-22} alkyl, (Un) subst. phenyl; $R^4 = H$, C_{1-14} alkyl, Ph.

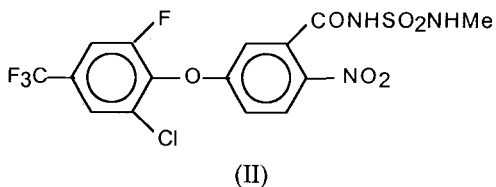
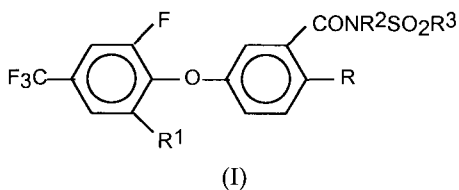
Herbicides, fungicides and plant bactericides

44

- 5-Phenoxy - N - Sulfonyl benzamide



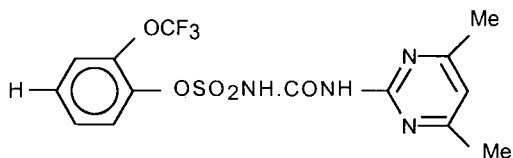
- Diphenyl ether Compounds:



- Phenoxyesters of N - [(heterocyclic) aminocarbonyl] sulfamic acid



Example compound:



Herbicidal compounds

Compound II

gave a complete kill of *Chenopodium album*

premergent.

45

Inhibit the growth of weeds and also possess herbicidal activity. Compd.

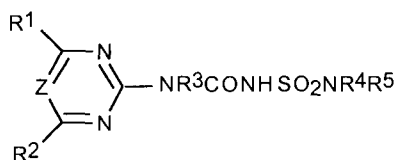
II gave total control of *Amaranthus retroflexus*.

46

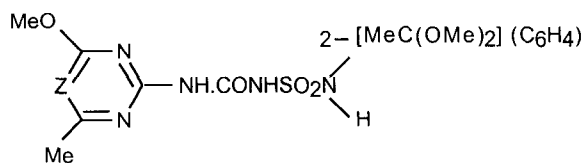
Herbicidal

47

- Triazinylurea derivatives

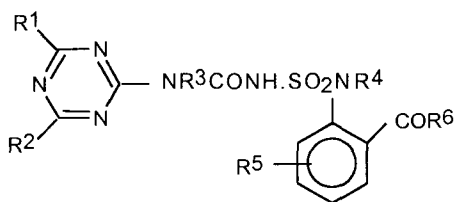


Example compound:



Herbicides **48**

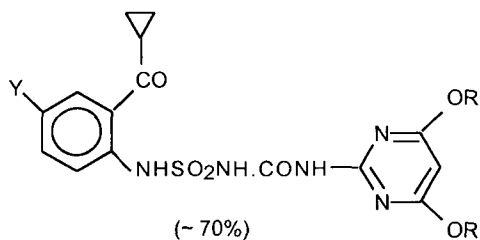
- Sulfamoyl urea



Example compound:

$R^1 = \text{Me}; R^2 = \text{OMe}; R^3 - R^5 = \text{H}; R^6 = \text{Me}$

- 1- [2- (Cyclopropylcarbonyl) phenyl] sulfamoyl - 3 - (4, 6 - diaoxy - 2 pyrimidinyl) urea



Herbicidal activity

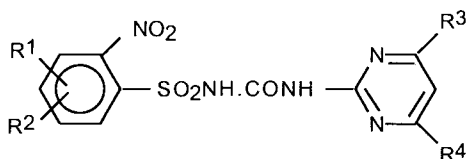
These herbicides cause moderate to severe injury to a variety of broad leaf and grassy weeds, both pre and post-emergent.

49

Herbicides **50**

Y = H, halo, alkyl, haloalkyl; R = alkyl.

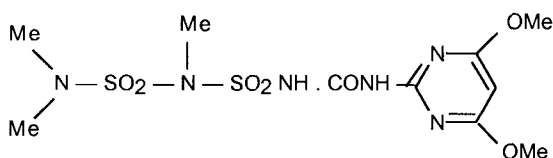
- Pyrimidinyl urea derivatives



Herbicides/
plant
growth
regulators

51

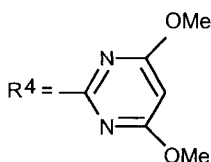
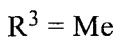
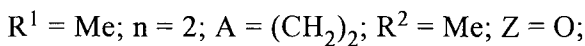
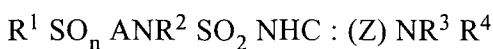
- Heterocyclosulfonyldiamide



Herbicides/
plant growth
regulators

52

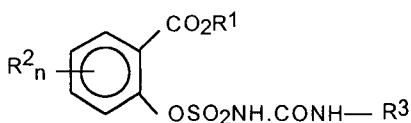
- Sulfonyl ureas



Herbicides/
Plant growth
regulators

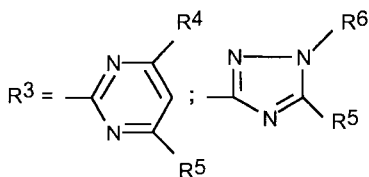
53

- 2 - Heterocyclureido sulfonyloxy benzoate ester

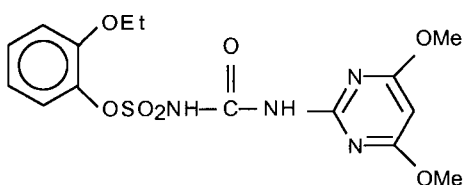


Herbicides/
Plant growth
regulators

54



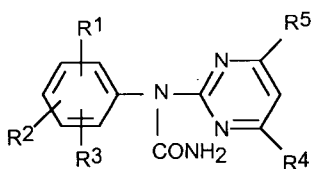
- 2 -Alkophenoxy sulfonyl ureas



Herbicides/
plant growth
regulators

55

- N - Phenyl - N - pyrimidinyl ureas

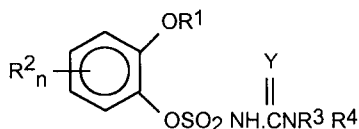


Herbicides/
plant growth
regulators

56

$R^1 - R^3 = H; R^4 = OMe; R^5 = H.$

- Heterocyclic substituted phenoxy sulphonyl ureas

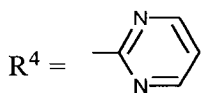


Herbicides/
Plant growth
regulators

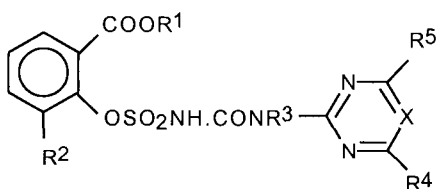
57

Example compound:

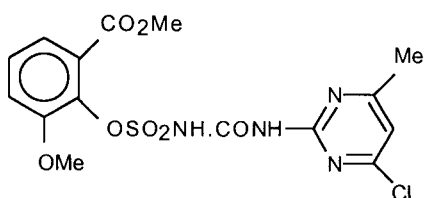
$R^1 = CH_2 CH_2 Cl; R^2_n = N_2 O; Y = O; R^3 = H;$



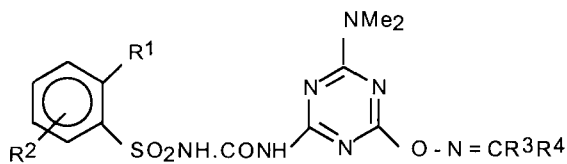
- Carboxyaryloxy sulfonyl ureidoazines



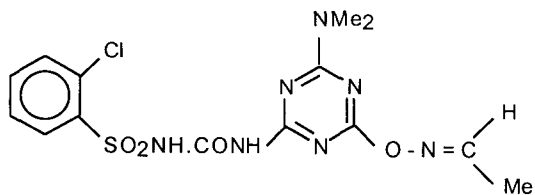
Example compound:



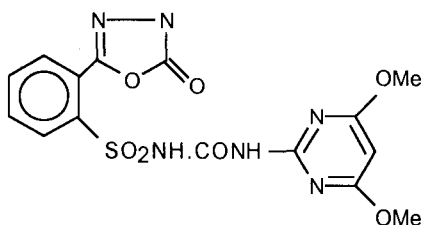
- 1-(Benzenesulfonyl)-3-(2-triazinyl) ureas



Example compound:



- Sulfonyl heterocyclyl urea



Herbicides/
Plant growth
regulators

58

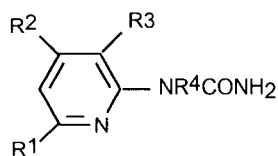
Plant growth
regulators

59

Herbicides/
Plant growth
regulators

60

- N - Phenyl - N - pyridylureas

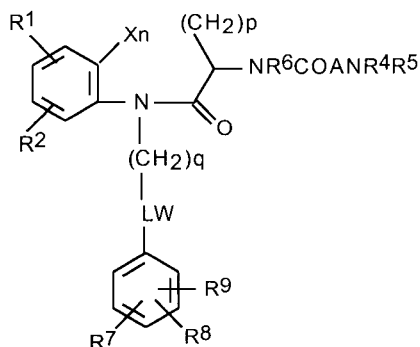


Example compound:

$R^1 = \text{Et}$; $R^2 = \text{CF}_3$; $R^3 = \text{H}$;

$R^4 = 2 - \text{NO}_2 - \text{C}_6\text{H}_4$

- (Tetrazoylbiphenylmethyl) benzazepinones and related compounds



Example compound:

3- Amino -3- methyl -N- [2, 3, 4, 5 - tetrahydro -2- oxo - 1 - [2' - (1H - tetrazol -5- yl) [1, 1' - biphenyl] -4- yl] methyl] - 1H-1- benzazepin - 3R - yl] butanamide trifluoroacetate. (89%)

Herbicides/
Plant growth
regulators

Example
compound gave
complete control
of Avena, Setaria
and Stellaria
(pre-emergent).

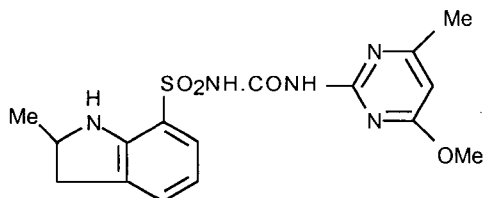
61

Growth
hormone
release
promotors

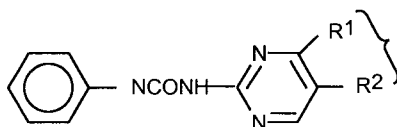
62

- N- (Azinyl carbamoyl) Sulfonamide

Example compound:

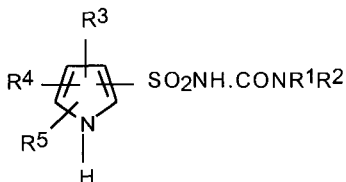


- N - Phenyl - N - pyrimidinyl ureas

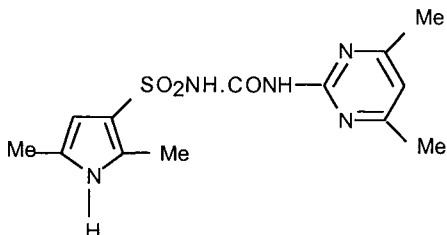


$R^1, R^2 = \text{alkylene}$

- Pyrrole sulfonamides and sulfamyl chloride intermediates



Example compound:



Herbicides and plant growth inhibitor

The example compound is claimed to have exhibited complete control of *Echinochloa crus-galli*.

63

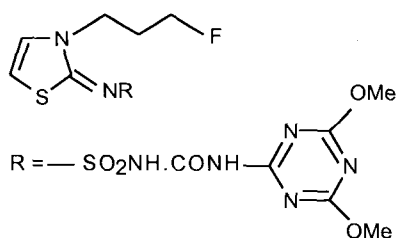
Pre & postemergent herbicides

64

Herbicides at pre and post emergence

65

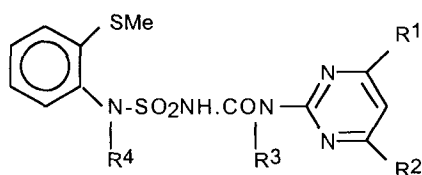
- Fluropropylthiazoline derivatives



Herbicides for post - emergence foliar application.

Exerts 90% control over the following weeds, *Amaranthus retroflexus*, *Stellaria media*, *Polygonum blumei*, *Chenopodium album*, and *Avena fatua*. (Claimed to give no damage to beet). **66**

- [(Methylthiophenyl) amino sulfonyl ureido] pyrimidine



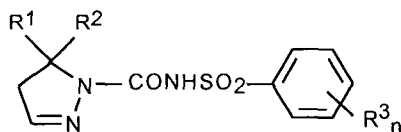
Post emergent herbicidal activity

67

Example compound:

R¹ R² = OMe, R³, R⁴ = H

- 2- Pyrazolines



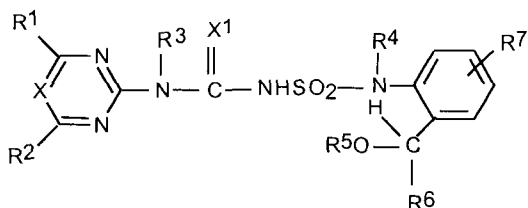
Example compound:

R¹, R² = Me; R³ = Cl; n = 2

The example compounds had more post emergence activity than pre emergence and were more active on dicot than on monocot weeds.

68

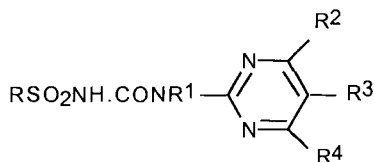
- Phenylsulfamoyl (triazinyl) ureas



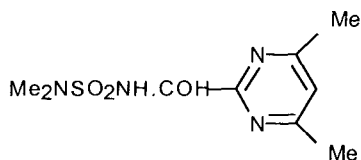
Example compound:

$R^1 = \text{MeO}$; $R^2 = \text{Me}$; $R^3, R^4, R^5, R^7 = \text{H}$, $R^6 = \text{Me}$, $X = \text{N}$, $X^1 = \text{O}$.

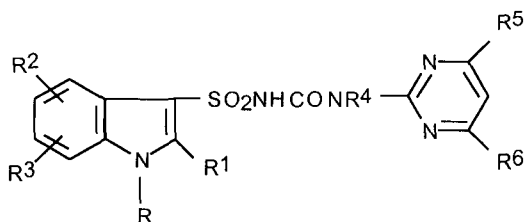
- Sulfamoyl chlorides



Example compound:



- Herbicidal Indole sulfonamides



Example compound:

$R^1 = \text{Me}$; $R^1 = \text{CO}_2 \text{Me}$; $R^2, R^3, R^4 = \text{H}$; $R^5, R^6 = \text{Me}$.

Herbicides

Provides pre-emergence and post emergence control of broad leaf and grassy weeds (severe to moderate injury).

69

Herbicidal

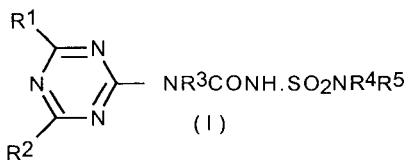
In postemergence application (the example compound) damaged bush-beam and cocklebur but did not damage wheat.

70

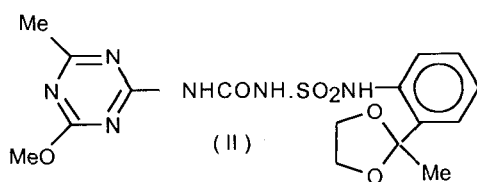
Pre - emergence gave 100% control of nutsedge.

71

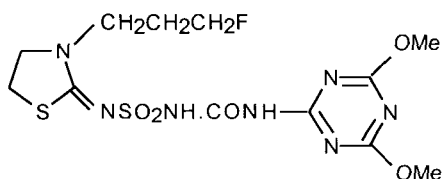
- Indole Sulfonyl ureas
- Sulfamoyl urea derivatives



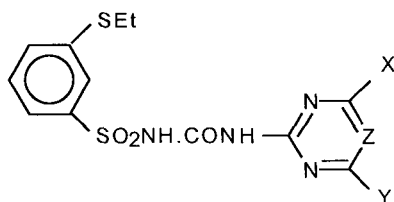
Example compound:



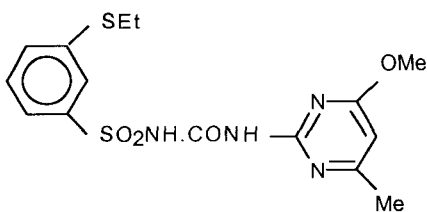
- Fluoropropylthiazolidine derivative



- N-Azinylo - (2- ethylthiophenylsulfonyl) ureas



Example compound:



Herbicides 72

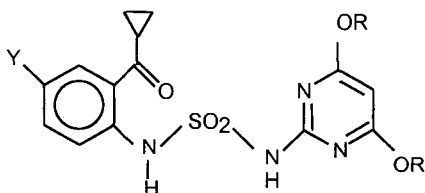
Herbicidal activity
The compound (II)
was effective
against 8 weeds
in both pre and
post-emergence.

73

Selective
herbicides 74

Selective
herbicides 75

- 1- [[2- (cyclopropylcarbonyl) phenyl] sulfonyl] - 3 - (4, 6-dialkoxy -2- pyrimidinyl) urea compounds



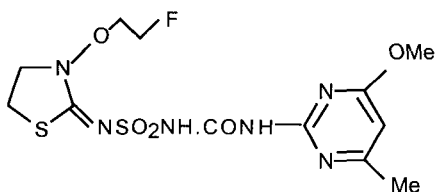
Crop - selective
herbicidal
compounds

76

Example compound:

Y = H; R = Me; Yield = 70%

- Fluoroethoxythiazolidine derivative



Selective
herbicide
suitable for
rice plants.

77

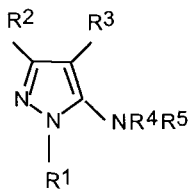
- 1- [[o- (Cyclopropylcarbonyl) phenyl] sulfamoyl] -3 (4, 6- dimethoxy -2- pyrimidinyl) urea

Selective
herbicides
especially
for cereals.

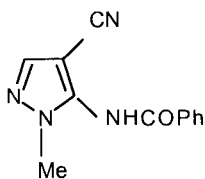
(totally
controlled
barnyard
grass and
*cyperus
serotinus* -
with no damage
to rice).

78

- 5- Amino -4- Cyanopyrazoles



(I)



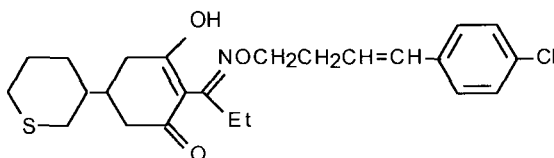
(II)

$R^1 = \text{alkyl}; R^2 = \text{H}, R^3 = \text{CN}; R^4, R^5 = \text{H}$

Herbicide softeners

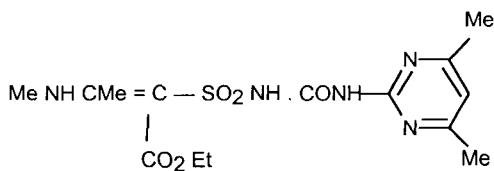
II reduced the damage to *zea mays* caused by herbicide III.

79



(III)

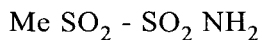
- 2 - Aminoalkenylsulfonamide ureas



Plant protection agents

80

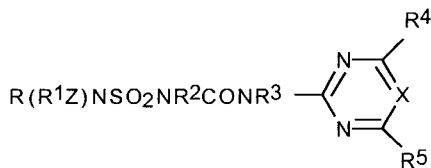
- Sonfonamide (herbicide antidote composition)



Useful for plant protection against injury from herbicides.

81

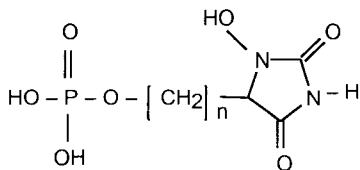
- N-Alkoxy and N-alkylsulfonylamino sulfonyl ureas and pyrimido (triazino) thiazine oxides as their intermediates



Example compound:

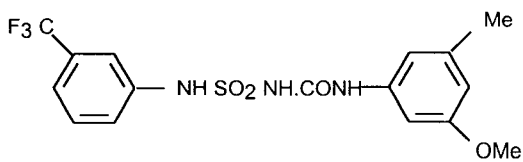
R, R¹, R⁴, R⁵ = Me; R², R³ = H; X = CH²; Z = O

- 1 - N - Hydroxyhydantoin 5 phosphates



(n = 1, 2)

- Sulfonylureido derivatives

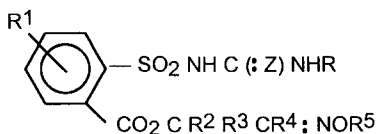


Example compound gave 80-100% control of *Echinochloa crus - galli* (post - emergence tests). **82**

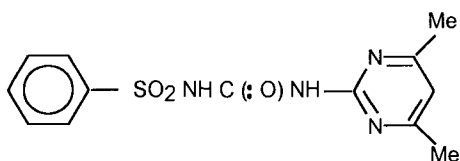
Potential fungicides **83**

Herbicidal and fungicidal Organisms tested include: *Echinochloa crusgali*, *Amaranthus retroflexus*, *Piricularia oryzae*. **84**

- 2- (Alkoxyiminoalkoxycarbonyl) phenyl sulfonyl ureas



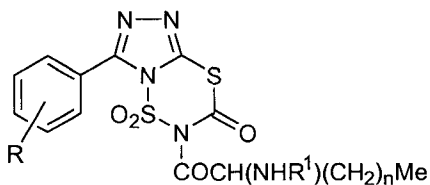
Example compound:



Prevents artificial infection of rice by *Pricularia oryzae*.

85

- 5-(2-aminoalkanoyl)-8-aryl-4(5H)-oxo-1,2,4-triazolo[4,3-b]-1,4,2,6-dithiadiazine 6,6-dioxide derivatives

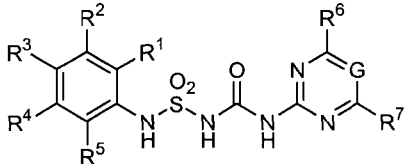

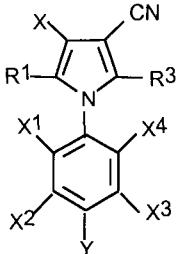


(R = H, 4 -Cl, 4 -Me, 4 - MeO, 4 - NO₂, 2-Cl;
n = 5,9,13; R¹ = H)

Were tested for their fungicidal activity.

86

II-2 Pesticides, Insecticides and Fungicides

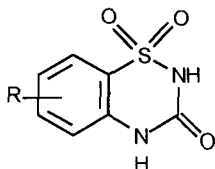
General Name & Structure of Compound	Applications	Ref.
<ul style="list-style-type: none"> Pesticides based on CSI (Cl SO₂ N = C = O) 	Pesticides	87
<ul style="list-style-type: none"> Pesticides based on perfluoroalkane sulfonyl isocyanate R SO₂ N = C = O R = C₁ - 8 perfluoroalkyl 	Pesticides	88
<ul style="list-style-type: none"> Phenyl Amino Sulfonyl Ureidoazines  	Pesticides	89
<ul style="list-style-type: none"> Pyrrole derivatives Example compound:  	Endo and ectoparasiticides	90
<ul style="list-style-type: none"> N (Chlorosulfonyl) carbamoyl phosphate Cl SO₂ NH COP (O) OMe)₂ 	Plant protective agent/pesticides	91
<ul style="list-style-type: none"> 1-Arylpyrroles  	Pesticidal activity (100% control of aphids, mites, southern army-worms, etc.)	92

Example compound:

$R^1 = \text{NCCH}_2\text{CH}_2$; $R^3 = X^1 = X^4 = \text{Cl}$,

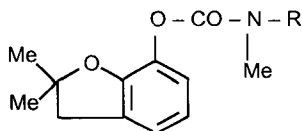
$X = \text{F}_3\text{CSO}$; $Y = \text{F}_3\text{C}$; $X^2 = X^3 = \text{H}$

- 1-Phenyl-3-phenylaminosulfonyl ureas



$R = 7\text{-Me}, 5, 8 = \text{Me}_2; 7\text{-Cl}, 7 \text{ and } 5\text{-Br}, 7\text{-Iodo}, 5\text{-MeO}$

- Dimethyl benzofuranyl - N - (Sulfonyl carbamoyl) - N - Methyl carbamate.



$R = \text{CONHSO}_2\text{Cl}$

- Isothiourea compounds:

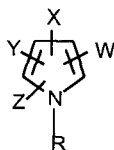
$\text{RN} : \text{C} (\text{SR}^2) \text{NR}^1 \text{R}^3 \dots (\text{I})$

Example compound:

$\text{Et N} : \text{C} (\text{SPh}) \text{NC}_{10}\text{H}_{21} \text{CONH Ph}^*$

* = Substituted

- Haloalkylthio, -sulfinyl and sulfonyl aryl pyrrole



Useful as potential pesticides for protecting crop plants.

93

Insecticides:
100%
Nephotettix cincticeps.

94

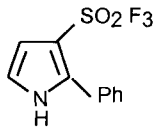
Lepidophericidal activity (organism tested: Salt marsh caterpillars, cabbage loopers and tobacco budworms). Several I showed bactericidal and fungicidal activity.

95

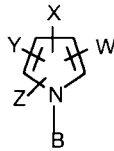
Insecticidal and acaricidal agents (these compounds gave complete kill of southern armyworm, tobacco budworm etc.)

96

Example compound:



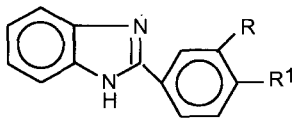
- Pyrrole carbonitrile and nitropyrrole



Example compound:

B = H; X, Y, Z = 2, 4, 5 - Cl₃; W = 3 - cyano.

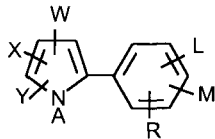
- N-Unsubstituted (Carbamoyloxy) nitro-styrenes



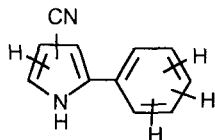
R = H; R¹ = OH

R = OH; R¹ = H, OMe

- Phenyl pyrrole derivatives:



Example compound:

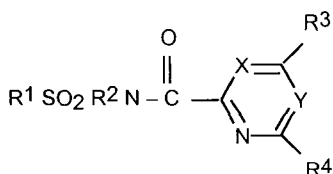


Isecticidal, acaricidal and molluscicidal agents. Example compound shows 100% kill against *Spodoptera eridania* 3rd instar larvae and *Tetranychus urticae* P resistant strain. 97

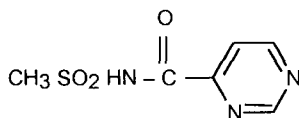
Molluscicidal and fungicidal activities 98

for controlling phytopathogenic fungi 99

- Pyrimidines derivatives

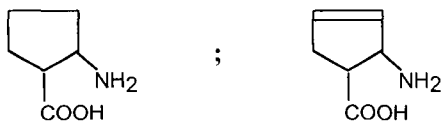


Example:



Agrochemical,
fungicides and
herbicides
(Very good
control of
*Pseudoperonospora
cubensis*) **100**

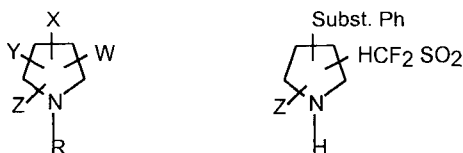
- cis* - 2 aminocyclopentane - 1 - carboxylic acid; *cis* - 2- aminocyclopent - 3- ene - 1- carboxylic acid



Fungicides
for the control
of *Plasmopara
viticola* **101**

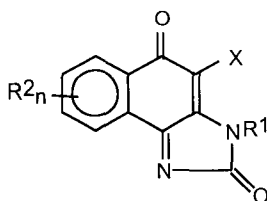
- Haloalkylthio, sulfinyl and sulfonyl aryl pyrrole

Example Compound :



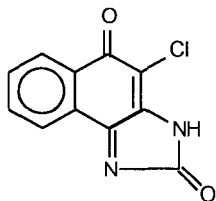
Fungicidal
agents **102**

- 4 - Halonaphth [1, 3 - d] imidazole, 2, 5 - dione derivatives

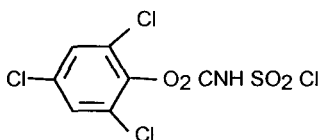


Plant
fungicides **103**

Example compound:

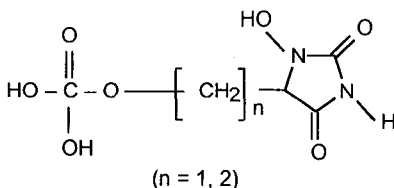


- 2, 4, 6 - Trichlorophenyl chlorosulfonyl carbamate



Fungicides/
bactericides **104**

- 1-N-hydroxyhydantoin 5-phosphates

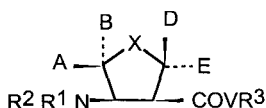


Potential
fungicides **105**

- Derivatives of β -aminopropionic acid

Fungicidal activity
> 90% control of vine
mildew (*Plasmopara*
viticola) and cucumber
mildew (*Sphaerotheca*
fuliginea). **106**

- 2 - Aminocyclopentane - and cyclopentene
- 1 - carboxylic acid derivatives

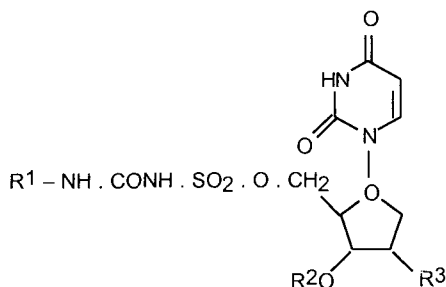


Example compound:

X = O; A, B, D, E = H; R¹, R², R³ = H; V = O

Fungicides:
Controlled
Plasmopara
viticola on
grape and
Phytophthora
infestans
lycopersici
on tomato. **107**

- 5¹ - 0 - (glucosylureidosulfonyl) uridine derivatives



Potential
antiviral
activity

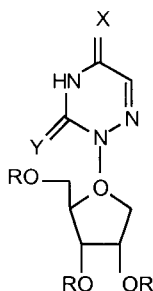
111

Example compound:

R¹ = 2, 3, 4, 6 - Tetra - 0 - benzyl - a D-glucopyranosyl

R² = H; R³ = CMe₂O.

- Orotidine - 5¹ - monophosphate decarboxylase inhibitors and analogs including 6-azauridine - 5¹ - (ethylmethoxyalaninyl) phosphate (a 5¹ - mono-phosphate drug)



R = H, Ac; X = Y = O, S;

X = O, Y = S;

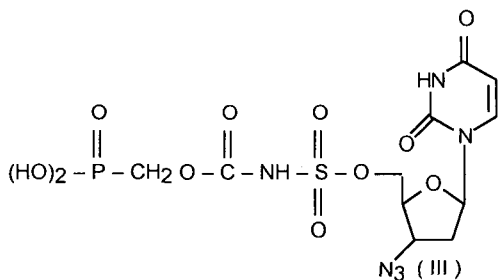
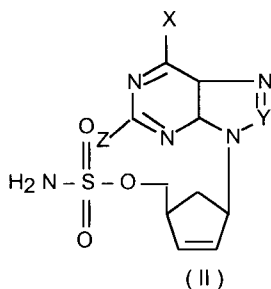
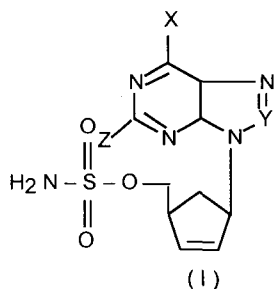
X = S, Y = O

Antiviral (*in vitro*/
in vivo)

The five RNA viruses include : Japanese encephalitis (JE), yellow fever (YF), sandfly fever (SF), Puntatora (PT) and venezuelan equine encephalomyelitis (VEE). No *in-vivo* activity was, however, obtained in the case of JE, PT and VEE infected mice.

112

- Sulfamoyl nucleosides related to carbovir and AZT

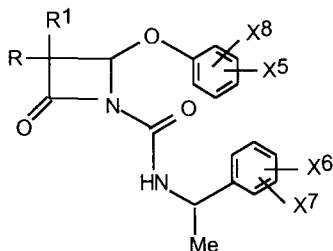


Some analogues exhibited significant *in-vitro* anticancer activity.

116

- I (X = OH; Y = CH; Z = NH₂)
 X = NH₂; Y = CH; Z = H
 X = NHMe; Y = N; Z = H
 X = NMe₂; Y = CH; Z = OH
 II (X = NH₂; Y = CH; N, Z = H)

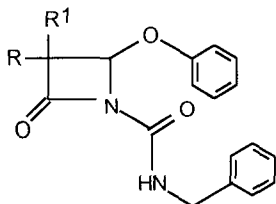
- Azatidinones



Useful in the treatment of leukemia.

117

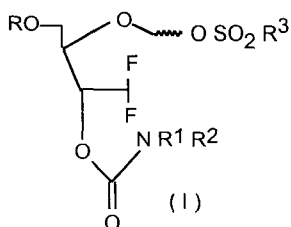
Example compound:



- 2 - Chloroethyl nitrososulfamides (CENS)

These compounds show a significant oncostatic activity towards both A549 and MCF 7 cell lines. **118**

- 2, 2 - Difluoro - 3 - carbamoyl ribose sulfonate



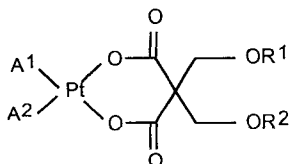
Antiviral and anticancer agents

119

[R = hydroxyprotecting group; R¹, R² = H, (Un) subst. alkyl, (Un) subst. Ph.; R³ = alkyl]

Compd. (I) 2¹ - deoxy - 2¹, 2¹ - difluorobetacytidine and other beta anomer nucleosides

- Platinum (II) complexes

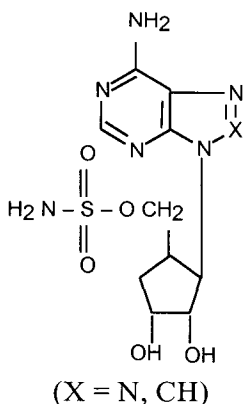


Antitumor activity

120

R^1, R^2 = Phosphorylcholine, Un (subst.) famoyl or carbamoyl; $A^1 H^2$ = amine, cycloalkylamine, (Un) subst. diamines, diamino compounds etc.)

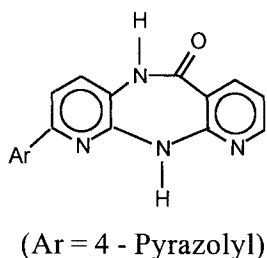
- Preparation of Phorboid Compounds as protein kinase modulators
 - 5¹-Sulfamoylated purinyl carbocyclic nucleosides
- Anti-inflammatory and also exhibit activity against T-24 human bladder carcinoma cells (i.e., anticancer agents). **121**



Antitumor and antibacterial **122**

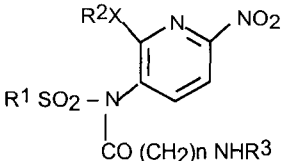
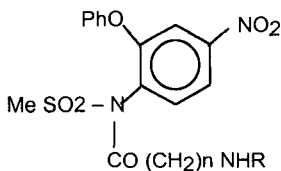
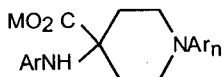
- Glycosyl oxycarbonyl amino - sulfonyl - 2¹, 3¹ - dideoxynucleoside derivative
- 2 - Heteroaryl - 5, 11 - dihydro - 6H - dipyrido [3, 2_{-b}: 2', 3' -_b] [1, 4] diazepines

Anti-HIV activity. **123**

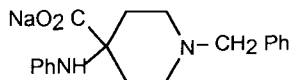


Used in the prevention or treatment of HIV infection. **124**

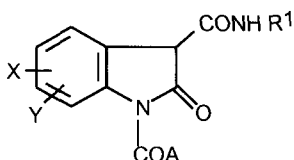
II-4 Biological Activities

General Name & Structure of Compound	Applications	Ref.
Analgesics/anti-inflammatory compounds		
<ul style="list-style-type: none"> ● β-Phenylthioarylamine derivatives $p\text{-R C}_6\text{H}_4\text{S CH} = \text{CMe CONH}_2$ $\text{R} = \text{H, Me, Cl NO}_2$ 	Useful as antiphlogistics or analgesics.	125
<ul style="list-style-type: none"> ● Lysine salt of 6- Chloro - 5- fluoro-3 (2-thienyl)-2 oxindole -1- carboxamide 	An anti-inflammatory analgesic agent	126
<ul style="list-style-type: none"> ● Nitrosulfonamido pyridine derivatives <div style="text-align: center; margin: 10px 0;">  </div>	Anti-inflammatory, antipyretic and analgesic agents	127
Example compound:		
I. HCl [$\text{R}^1 = \text{Me}$; $n = 1$; $\text{R}^3 = \text{H}$; $\text{X} = \text{O}$; $\text{R}^2 = \text{cyclohexyl}$]		
<ul style="list-style-type: none"> ● 4-Nitro-2- phenoxy - sulfonanilide derivatives <div style="text-align: center; margin: 10px 0;">  </div>	Useful as anti-inflammatory, antipyretic and analgesic agents.	128
Example compound:		
I. HCl [$\text{R} = \text{H}$]		
<ul style="list-style-type: none"> ● Substd. alkalimetal 1-arylalkyl -4- arylamino - piperidine -4- carboxylate 		
<div style="text-align: center; margin: 10px 0;">  </div>		

Example compound:



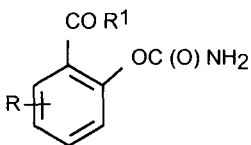
- 1- Substd. Oxindole -3- carboxamines



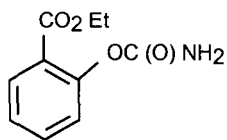
Example compound:

X, Y = H; A = NH₂, R¹ = 2, 4 - Cl₂ C₆ H₃.

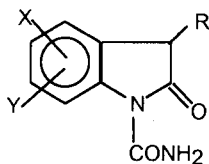
- O-Carbamoyl salicylate esters



Example compound:



- 2-Oxindole -1- carboxamides and their intermediates



Example compound:

X, Y, R = H

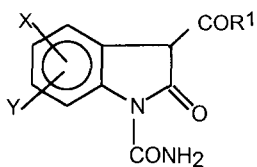
Opionoid
analgesics **129**

Useful as anti-
inflammatory,
antipyretic and
analgesic agents **130**

Analgesic and
anti-inflammatory,
activity **131**

Useful as
intermediates for
analgesic and anti-
inflammatory,
agents. **132**

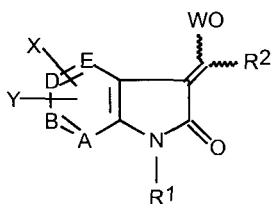
- 3-Substd. -2- oxindole -1- carboxamides



Example compound:

I; X = 5.Cl; Y = H; R¹ = Thienyl

- Azaoxindole -1- carboxamide

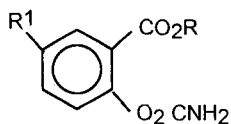


Example compound:

A = N; B, D, E = CH; X, Y = H;

R¹ = Alkyl, R² = Alkyl, W = H

- 2-Carbamoyloxy benzoates



Example compound:

R = alkyl; R¹ = H.

Useful as intermediates analgesic and anti-inflammatory agents (mice & rats).

133

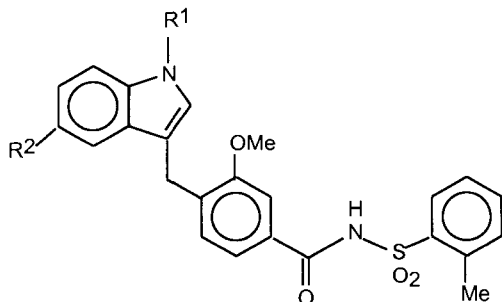
Anti-inflammatory, and analgesic

134

Analgesic and anti-inflammatory agents

135

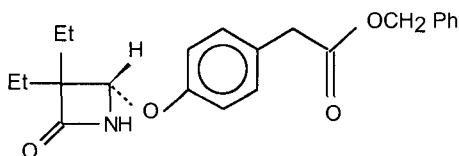
- Indole carbamates



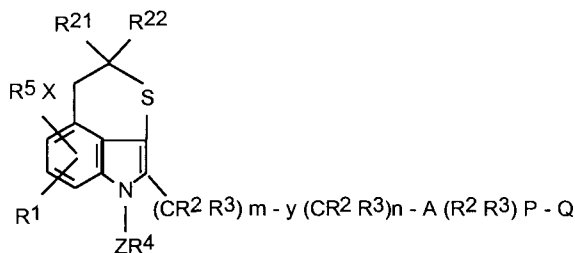
Example compound:

$R^1 = \text{CONHCH Ph}_2$; $R^2 =$
Cyclopentylloxycarbonylamino

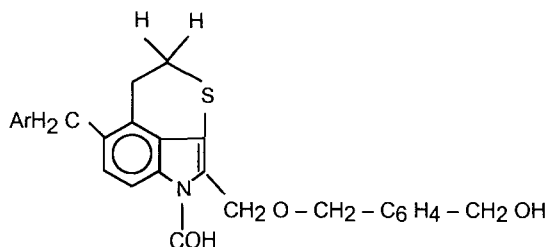
- 4- [(4 - Oxo - 2 - azetidiny) oxy] benzenealkanoates



- Aryl-1H-thiopyrano-[2, 3, 4 - cd] indoles



Example compound:

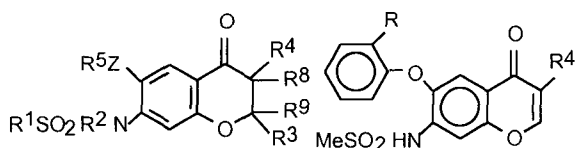


Useful in the treatment of asthma, rheumatoid arthritis, osteoarthritis, bronchitis, chronic obstructive airways disease, psoriasis, allergic rhinitis, atopic dermatitis, shock and other inflammatory diseases. **136**

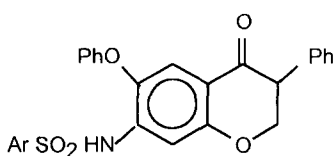
It shows elastase inhibition, so it is used as an anti-inflammatory agent as well as an anti-degenerative agent. **137**

Inhibitors of leukotriene biosynthesis. Useful as antiasthmatic, antiallergic, anti-inflammatory, cytoprotective agents, treating anginal pain, cerebral spasm, glomerular nephritis, hepatitis, endotoxemia, psoriasis, uveitis, and allograft rejection and in preventing the formation of atherosclerotic plaques. **138**

- 7-Methanesulfonylamino-6-phenoxy-4H-1-benzopyran-4-ones and analogues



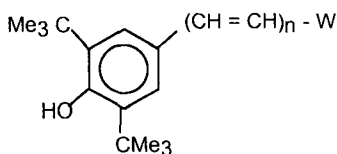
Example compound:



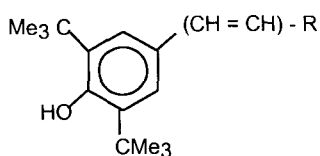
Anti-inflammatory agents and antipyretics

139

- (3, 5-Di-tertiary-butyl-4-hydroxy phenyl) thiadiazoles, oxadiazoles, and triazoles

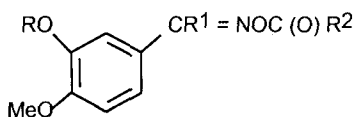


Example compound:



R = Substd. 1, 3, 4 - oxa-group.

- Oxime-carbamates and oxime carbonates

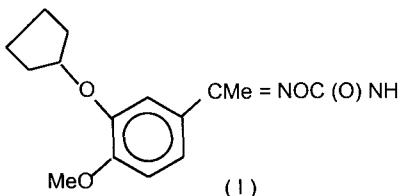


Anti-inflammatory

140

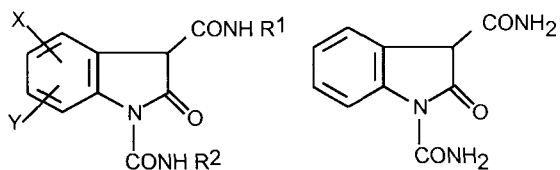
Useful as anti-inflammatory and as bronchodilators.

Example compound:

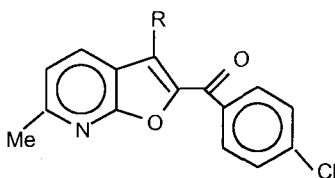


● Oxindole - 1, 3-Carboxamide

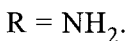
Example compound :



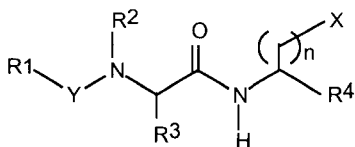
● 3-ureidopyridofurans and -pyridothiophenes



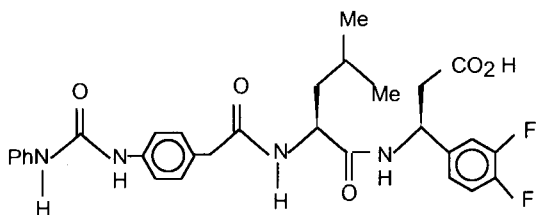
Example compound:



● Dipeptide derivatives



Example compound:



(significant activity in inhibiting phosphodiesterase is associated with I.

141

Anti-inflammatory activity

142

Treatment of inflammatory processes

143

Inhibit and prevent cell adhesion-mediated pathologies. Also useful for the treatment of many inflammatory and auto-immune diseases.

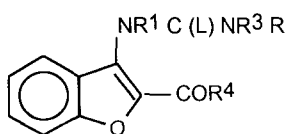
144

- Thiophene compounds

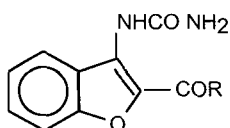
Useful as antiviral, anti-inflammatory and immunoregulatory agents.

145

- Preparation of heterocyclyl carbonyl - subst. benzofuranyl Ureas as anti-inflammatories



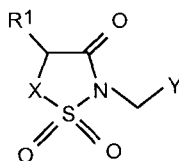
Example compound:



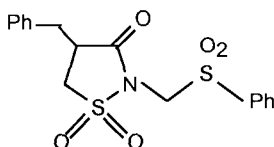
R = [Unsatd. subst. benzalnelated heterocyclyl group]

Anti-inflammatory 146

- Derivatives of Isothiazolidin -3- one - 1, 1- dioxide and 3-oxo-1, 2, 5- thiadiazolidine 1, 1- dioxide



Example compound:



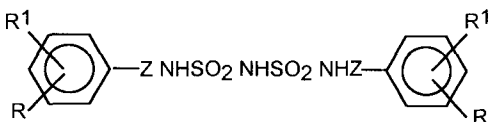
Useful as anti-inflammatory and anti-metastatic agents.

(Serine protease inhibitor)

147

Anti-allergics

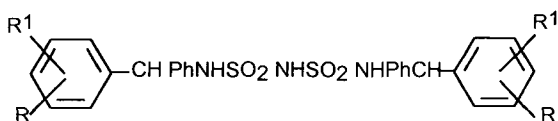
● Imidodisulfamide derivatives



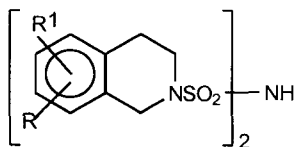
Anti-allergic activity

148

Example compound:

(R, R¹ = benzo)

● Iminodisulfamides



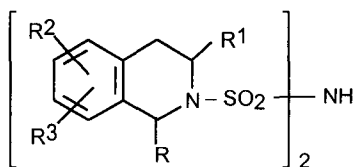
Anti-allergic activity

149

Example compound:

R = H; R¹ = 7-(3-Cl C₆H₄NHSO₂)

● Imidodisulfamides



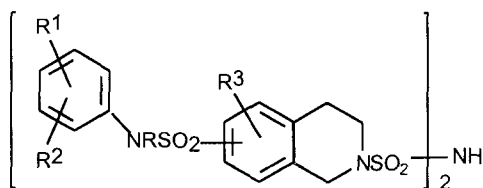
Anti-allergic (antagonism to the slow reacting substance of anaphylaxis).

150

Example compound:

R = R¹ = H, R² = 7-Cl; R³ = 8-Cl

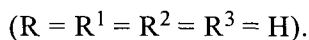
- N, N¹-Bis (subst.-1, 2, 3, 4 tetrahydroisoquinolyl) - disulfonylimides



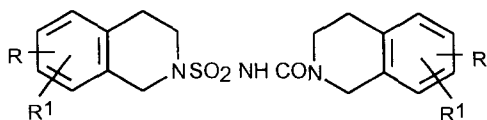
Useful in the treatment of allergy and asthma.

151

Example compound:



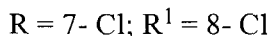
- Imidosulfamides



Anti-allergic activity

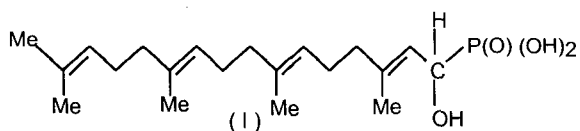
152

Example compound:

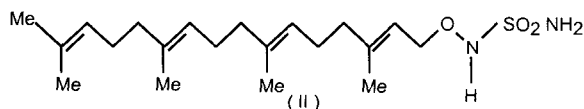


Anti-proliferative/anti-tumor agents

- Phosphorus and sulfur containing geranyl-geranyl derivatives



Antiproliferative activity (in eukaryotic cells). 153



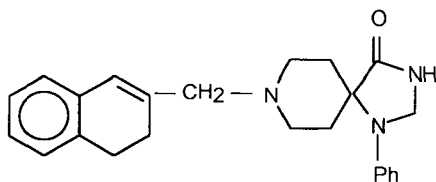
- Geranyl geranyl diphosphate inhibitors of post-translational Geranyl geranylation of cellular proteins.

Possibility of these compounds being useful as antitumor agents.

154

Neuroleptics

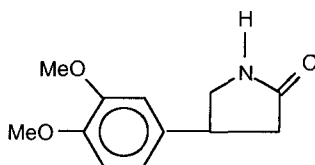
- Triazaspiro [4.5] decan - 4- one derivative



Neuroleptic activity

155

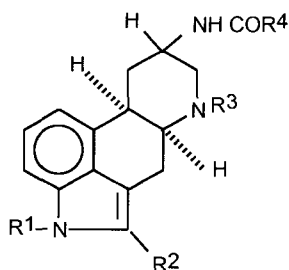
- 4-(Polyalkyloxyphenyl)-2- pyrrolidinones



Useful as tranquilizers.

156

- 8 α -(Acylamino) - ergolines



Useful as neuroleptic, antidepressant and prolactin secretion stimulators.

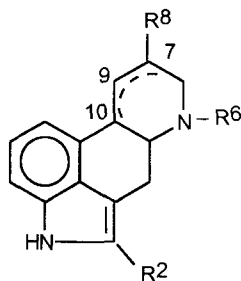
157

Example compound:

$R^1 = H, R^2 = CN;$

$R^3, R^4 = \text{Alkyl}.$

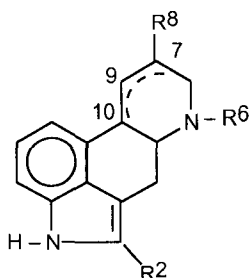
- 2-Substituted ergoline derivatives



Useful as neuroleptics and antidepressants.

158

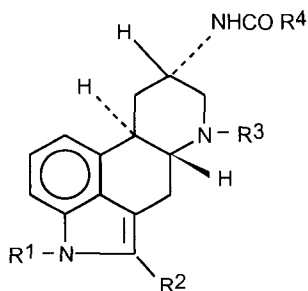
- Ergoline derivatives

Neuroleptics **159**

Ergoline [I], Single or double bond at 8 or 9; but no cumulative double bond.

R^8 α or β when bond at 8 is single;
 $R^2 = \text{CN, SR, SOR, C(O)R, CH(OH)}$
 ($R = \text{C}_{1-4}$ alkyl); $R^6 = \text{C}_{1-4}$ alkyl; $R^8 = \text{Me, NHCO NEt}_2, \text{NHCS NEt}_2$

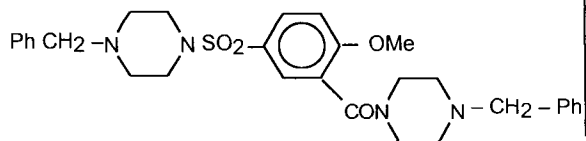
- 8 α -(Acylamino)-ergolines

Neuroleptic and antidepressant agents **160**

Example compound:

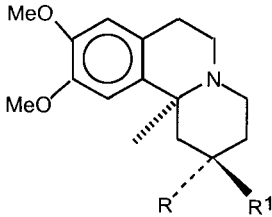
$R^1 = \text{H; } R^2 = \text{CN}$
 $R^3 = \text{Me; } R^4 = \text{Me}_3\text{C}$

- 5-[(4-benzylpiperazine) sulfonyl] -2-methoxybenzoic acid -4- benzylpiperiazide

Neuroleptic **161**

Anti-convulsants

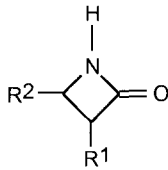
- Diastereomeric 9, 10- dimethoxy-1, 3, 4, 6, 7, 11b-hexahydrospiro [benzo[a] quinozolin-2, 4' - imidazoline-2', 5' -dione



Example compound:



- Adamantane - spirolactams



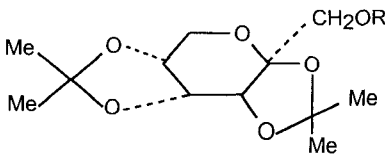
R^1 and $R^2 =$ Adamantyl group

- Phenyl and phenoxy ethylsulfamates and analogs
(HO)_p A (OSO₂ NR¹ R²) Z

Example compound:

A = Aryl; R¹, R² = H; p = 0, 1, Z = 1.

- O-Alkylsulfamates. 2, 3 : 4, 5-*bis*-O-(1-methylethylidene)- β -D- fructopyranose-sulfamate and related compounds



Example compound: R = SO₂ NH₂

Example compound exhibited anticonvulsant activity.

162

Useful for
anti-microbial
anti-convulsant
anti-hypoxia
anti-Parkinson
anti-colinergic
activities.

163

Useful as anti-convulsants.

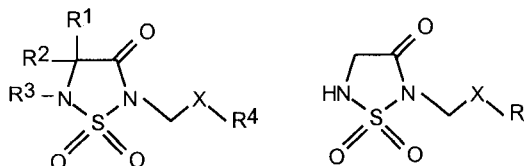
164

Potent anticonvulsant activity

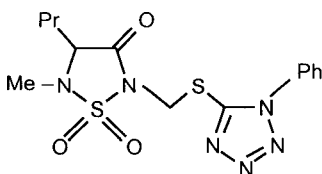
165

Anti-degenerative agents

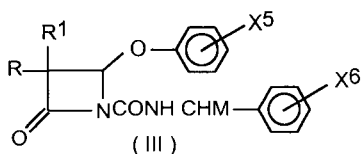
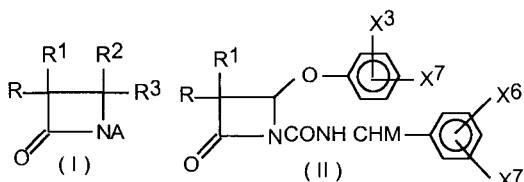
- 2-heterocyclyloxymethyl - and -2-heterocyclylthiomethyl- 1, 2, 5 - thiadiazolidin - 3 - one 1, 1-dioxide



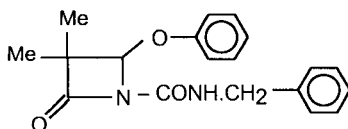
(R = Un (Substituted) tetrazolyl.)



- Substituted azetidinones



Example compound:



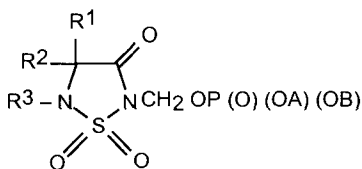
1) Useful for the treatment of degenerative diseases (elastase inhibitor).

166

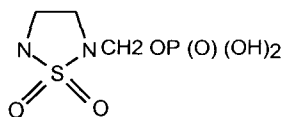
Anti-inflammatory and anti-degenerative agents

167

- Substd. 2-(phosphinyloxymethyl) - 1, 2, 5-thiadiazolidin -3- one 1, 1- dioxide



Example compound:



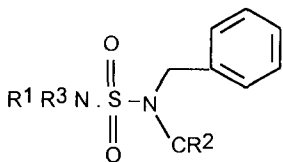
- 2-(2, 3, 5, 6- Tetrafluoro-4-pyridyl) -1, 2, 5-thiadiazolidin -3-one 1,1-dioxide

Useful as proteolytic enzyme inhibitor in the treatment of degenerative diseases. **168**

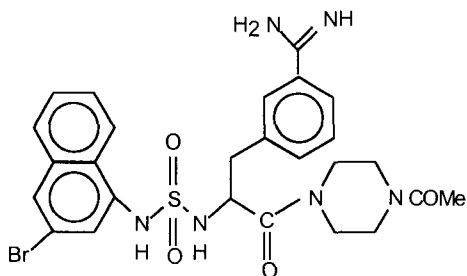
Useful for the treatment of degenerative diseases (emphysema, rheumatoid arthritis, and periodontal disease). **169**

Anti-coagulants

- Aminosulfonylphenylalanine derivatives

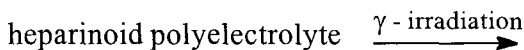
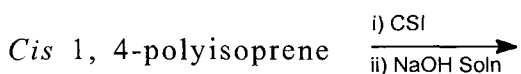


Example compound:



As oral antithrombotic agent - useful for the treatment of thrombosis. **170**

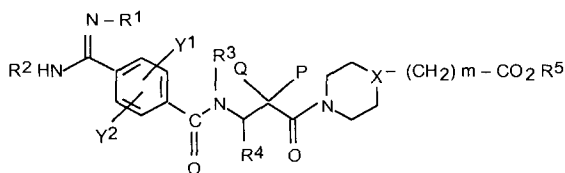
- Polyelectrolyte produced by the reaction of *cis* 1, 4- polyisoprene & CSI, followed by the addition of NaOH. Anticoagulant activity 171
- Synthetic polyelectrolyte - (Natural rubber + CSI, followed by treatment with NaOH) Anticoagulant activity 172
- Gaseous CSI treated styrene - isoprene-styrene block polymer. Antithrombic activity 173
- Unsaturated polyurethaneureas were modified by treatment with CSI to produce sulfamate and carboxylate groups on the film surface. Useful for the prevention and control of thrombosis. 174
- Hydrogels by irradiation of synthesised heparinoid polyelectrolyte



The polyelectrolyte hydrogels do not deplete antithrombin III from blood. 175

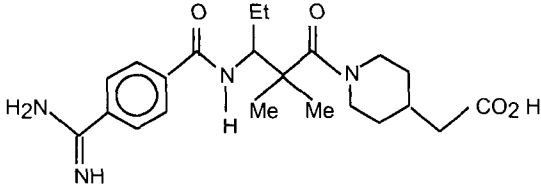
Hydrogels

- Fibrinogen receptor antagonists having subst. β -aminoacid residues and pharmaceutical compositions comprising the same



Useful for inhibiting platelet aggregation, blood coagulation in extracorporeal circulation, occlusion of arteries and reocclusion of coronary arteries. 176

Example compound:

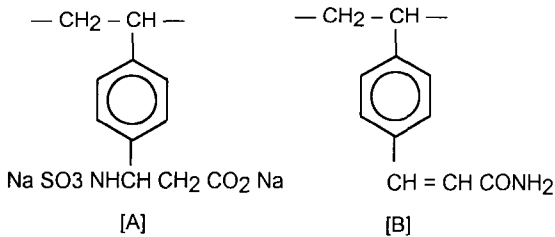


- Preparation of an asymmetric semipermeable membrane with anti-coagulant activity.

Semipermeable styrene - isoprene styrene block - copolymer membrane

- Asymmetric membrane with hemocompatible properties

A styrene polymer contg. a p- pendant vinyl function was modified by the gaseous CSI to give a membrane contg. A and B Units.



- Asymmetric membrane having blood compatibility

A new asym. membrane synthesized from an ABA poly (Styrene-isoprene) (SIS) block co-polymer + CSI (g) \longrightarrow heparin like compound

The membrane has a potential use in insulin delivery and hemodialysis. 177

Anticoagulant 178

Heparin like compound with enhanced blood compatibility. 179

- A asymmetric membrane prepared from styrene isoprene - styrene block co-polymer
styrene - Isoprene - styrene block polymer + CSI(g) \longrightarrow modified polymer

Anticoagulant property (Heparinoid type compound). **180**
- Surface modification of polycarbamate with synthetic polyelectrolyte -

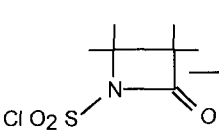
Natural rubber + CSI $\xrightarrow{\text{NaOH}}$ poly electrolyte

Activity similar to heparin. **181**
- A asymmetric membrane with hemocompatible properties

Poly (*p*-vinylstyrene) + CSI \longrightarrow desired membrane

Possesses heparin like properties. **182**
- Heparin - like polymeric bio - materials

Polybutadiene/polyisoprene $\xrightarrow{\text{CSI}}$ (I)



Cl O₂ S—N—C=O

\longrightarrow Heparin like material

Useful as heparinoid material. **183**
- Fibrinogen/platelet interaction changes due to surface treatment on polyvinyl chloride.

Poly (*cis* - 1, 4-isoprene) + CSI \longrightarrow polyelectrolyte

The polyelectrolyte may be useful in making polymer non-thrombogenic. **184**
- The synthesis of some polymeric biomaterials with potential blood compatibility.

Polybutadiene/Polyisoprene $\xrightarrow{\text{CSI (g)}}$ Modified polymer

Potential utility in blood contacting prosthetics. **185**

Blood related problems

- Asymmetric membranes from a styrene - isoprene - styrene block co-Polymer

(Styrene-isoprene-styrene) block copoly-

mer $\xrightarrow{\text{CSI (g)}}$ Modified polymer

Membranes have blood compatibility **186**

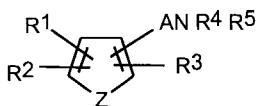
- o-Carbamoylsalicylates

o - NH₂ CO₂ C₆ H₄ CO₂ H

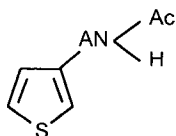
Agents for modification of hemoglobin **187**

Platelet aggregation, induction/inhibition

- Thiophene and Pyrrole derivatives



Example compound:



A = Alkylene

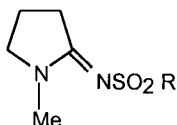
Useful for inducing platelet aggregation. **188**

- 5-(4- Amidinophenyl)- pentanoyl -3- (3-pyridyl) - propanoic acid.

Potent inhibitor of canine platelet aggregation (*in vitro*); orally active. **189**

Hypoglycemics

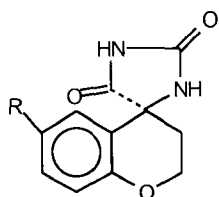
- N-1-(Methyl-2-pyrrolidinylidene) - sulfonamides



hypoglycemics, CNS depressants and diuretics **190**

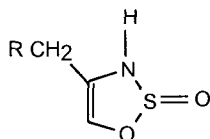
Inhibitors of aldose reductase

- Chiral hydantoin



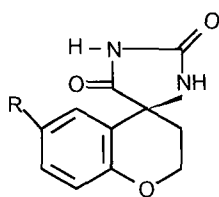
(R = Cl, F)

- Substituted 3H-1, 2, 3, 5-oxathiadiazole 2-oxides



(R = 1-chloro-3, 4-dihydro-2-naphthyl)

- Chiral hydantoin

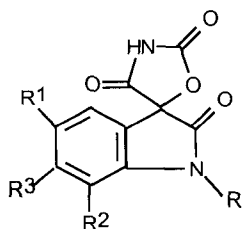


(I)

Example compound:

R = F (Sorbiniol); R = Cl

- Oxazolidinedione derivatives



(R = Cl) showed hypoglycemic activity.

191

Hypoglycemics

192

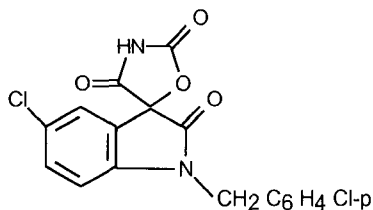
The chiral hydantoin (R = Cl) possesses greater hypoglycemic activity than sorbinil (R = F) in rats.

193

Useful as aldose-reductase inhibitors and hence used for the treatment of diabetes.

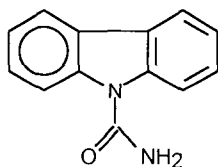
194

Example compound:



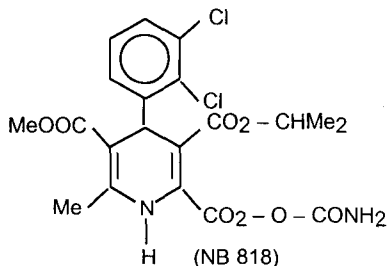
Brain related problems

- Carbazole



For ischemic brain 195

-

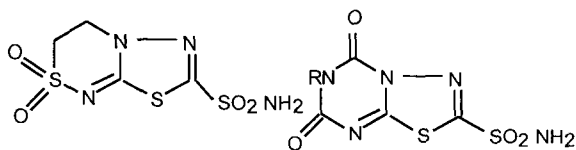


NB818 is described as a patent and selective ameliorant of the cerebral circulation. 196

Eye disorders

- Sulfamates
- Thiadiazolo [3, 2-a] pyrimidine - sulfonamides and thiadiazolo [3, 2-a] triazinesulfonamides

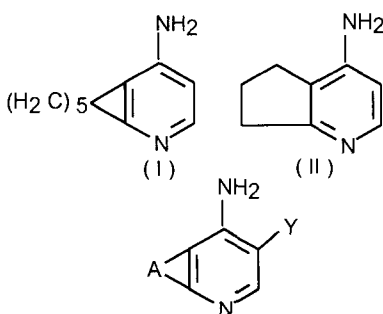
useful as antiglaucoma agents 197



Topically effective carbonic anhydrase inhibitors (ocular hypotensive agents). 198

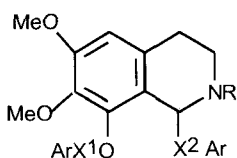
Heart related disorders

- 4-Aminoquinoline and 4-aminopentinyridine derivatives



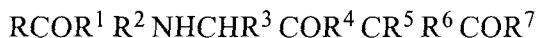
(General Structure)

- Isoquinolines derivatives

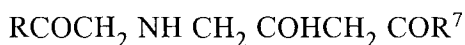


Ar = Aryl; X¹ and X² = Divalent alkylene C₁₋₄ chain optionally substituted with lower alkyl groups

- Carboxyalkyl dipeptide derivatives and pharmaceutical composition containing them



Example compound:



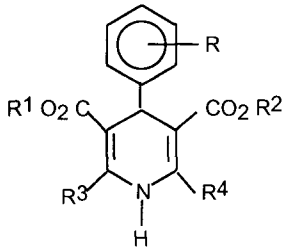
R-R⁷ = optionally substituted alkoxy

Improves brain disorder and heart function. Inhibits 5-lipoxygenase acetyl choline - stearase and anoxia, shows isotropic action and useful as cardiotonics and the treatment of heart failure, cerebral arteriosclerosis and Alzheimer type senile dementia. **199**

The HCl - salts were more effective than verapamil in the inhibition of ventricular fibrillation induced by reperfusion after coronary artery ligation in dogs. **200**

Antihypertensive **201**

- 2-Substituted or Unsubstituted aminocarbonyl - oxyalkyl - 1, 4- dihydropyridines



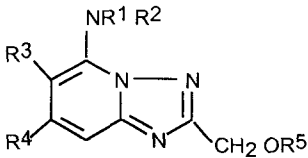
R = 2 - NO₂; R¹ = R² = Et; R³ = Me; R⁴ = CH₂ OH.

- 6, 7, 8, 9- Tetrahydro - 3H - Benz[a] indole heterocyclics

Increase the coronary blood flow 74% (in dogs).

202

- 7- Amino -2- (hydroxymethyl)-s-triazoles (1, 5-a) pyrimidine derivatives



Example compound:

R¹, R² = Et; R³ = H; R⁴ = Me, R⁵ = Ac.

Centrally acting compounds. These also show the effect on blood pressure, heart rate and rectal temp. (rats).

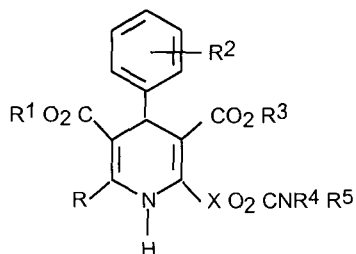
203

Useful in the treatment of cardiovascular disorders, especially cerebral ischemic diseases such as arteriosclerosis, cerebral and myocardial infarction, senile dementia, hyperlipemia etc.

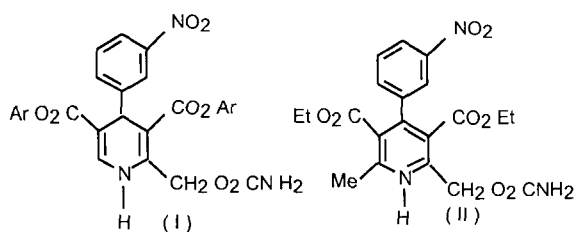
Example compound shows vasodilatory activity.

204

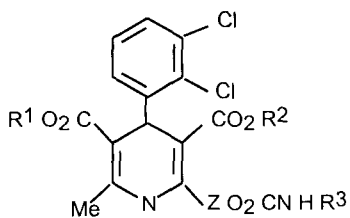
- 2- Carbamoyloxy alkyl - 1, 4- dihydroxy - pyridine derivatives and their intermediates



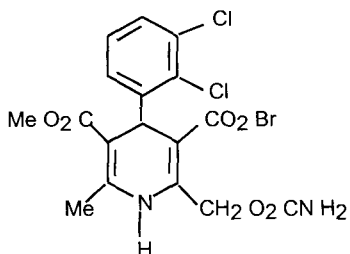
Example compound:



- Carbamoyloxyalkyl-1,4-dihydropyridines.



Example compound:



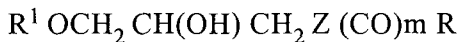
Useful for increasing cardiac flow and decreasing blood pressure (coronary vasodilators & Hypotensive).

205

Useful as coronary vasodilators and antihypertensives (experimental animal: rat).

206

- 3- Aminopropoxyaryl derivatives

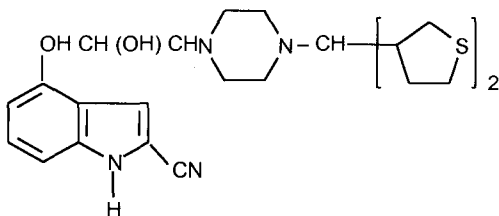


R = Un(Subst) alkyl; R¹ = arom. or heteroatom. radical

Z = piperidinylamino, 4-piperazinylamino, NR² (CH₂)_n NR³.

R², R³ = H, alkyl; n = 2-4.

- (Aryloxy) hydroxypropyl heterocycles

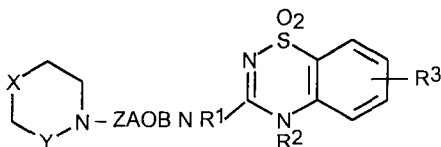


Useful as
cardiotonic,
antiarrhythmic
and α and
 β -sympatholytics. 207

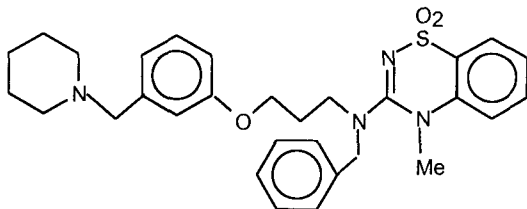
Cardiotonics 208

Disorders of stomach & gastro-intestinal tract

- 1, 2, 4- benzothiadiazine - 1, 1- dioxide derivatives

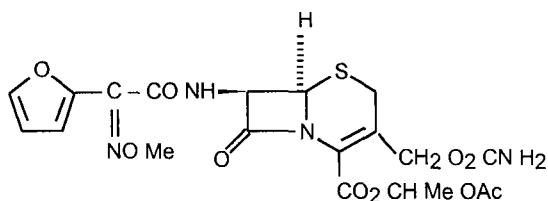


Example compound:



Useful for the
treatment of
peptic ulcer. 209

- Amorphous cefuroxime oxetil



Useful for improved bio-availability from gastro-intestinal tract. **210**

Bioartificial insulin distributor membranes

- Styrenic asymmetric membrane with homocompatible properties

Poly (*p*-Vinylstyrene + CSI \longrightarrow modified polymer

The membrane could be employed as an artificial insulin distributor. **211**

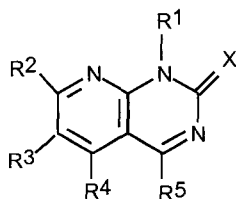
- Styrenic asymmetric membrane with hemocompatible properties

Vinyl subst. polystyrene + CSI \longrightarrow Polymer membrane.

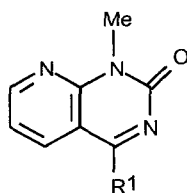
Membrane can be used as substrate for culturing islets of Langerhans for a bioartificial insulin distributor. **212**

Bronchial asthma

- Pyrido [2, 3 -d] pyrimidine derivatives



Example compound:

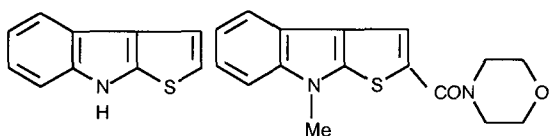


These compounds possess phosphodiesterase inhibitory activity- useful for the prevention and treatment of the respiratory disorder- bronchial asthma. **213**

R¹= Cycloalkyl optionally subst. by OH group.

CNS related disorders

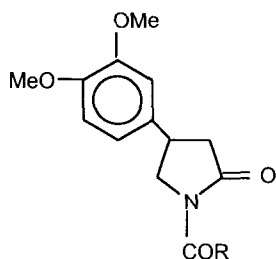
- Thieno [2, 3-b] indole derivatives



Useful in treating diseases in the CNS- related to the metabotropic glutamate receptor system.

214

- 4 - (3, 4 - dimethoxyphenyl) - 2 - pyrrolidinone -1- carboxylic acid derivatives



Example compound:

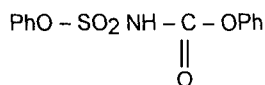
R = PhO

Possess central nervous depressant, apomorphine antagonistic and antinociceptive activities similar to that of chlorpromazine but with less tranquilizing and narcotic properties.

215

Lipid/cholesterol lowering agents

- (Aminosulfonyl) ureas and oxysulfonyl carbamates
- N-acyl sulfamic acid esters (or Thioester), n-acyl sulfonamides, and N-sulfonyl carbamic acid esters (or thioesters)



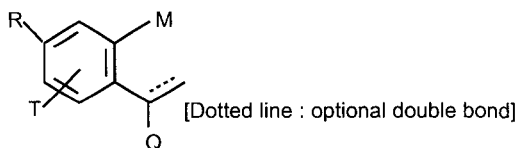
Lipid lowering activity

216

Useful for the treatment of hyper-cholesterolemia and atherosclerosis.

217

- (Amino alkyl) substituted benzoheterocyclic compounds



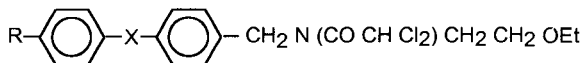
M = (Un) Substd. heterocyclic atom grouping

Q = Unsubstd. Cycloalkyl

T = H; R = (Un) substd. aminoalkyl]

Antibiotics

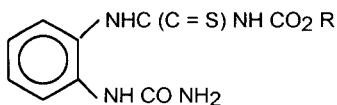
- N- (2- ethoxyethyl) -N- (4-Phenoxybenzyl) dichloroacetamides.



Example compound:

R = AcNH; X = O

- Substituted benzenesulfonic acid esters.



R = Alkyl

Compounds associated with antimycotic and antihypercholesteremic activities.

218

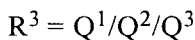
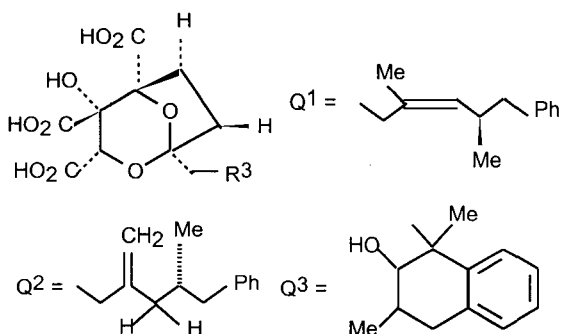
Useful as potent antiamoebic agents. - activity comparable or better than Etofamide and Teclozan.

219

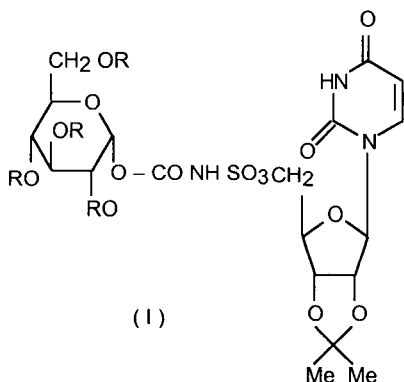
Anthelmintic activity

220

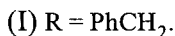
- 2, 5- Dioxabicyclo [3.2.1] octane -3.4.5 - tricarboxylate squalene synthase inhibitors



- Diphosphate modified antiviral analogs of uridine - 5' - diphosphate glucose derivatives
- Uridine - 5' - diphosphate glucose analogs Inhibitors of protein glycosylation that shows antiviral activity



Example compound:



i) Used as anticholesteremics and

ii) Active against fungi - e.g. *candida albicans*

221

Potent antiherpes activity

222

[I] Showed antiviral activity

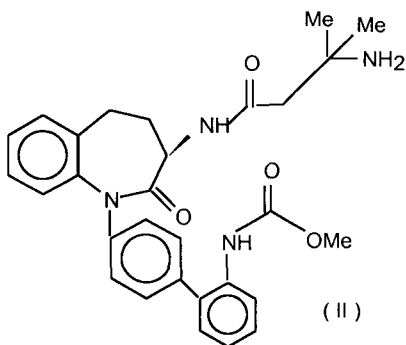
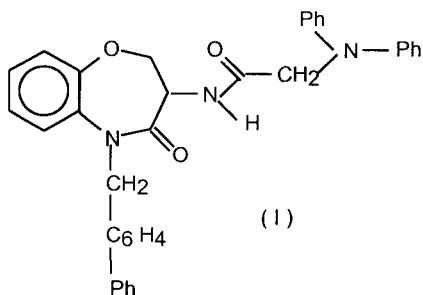
223

- 4- (*o*-substituted aminophenyl]-3-thioallophanates

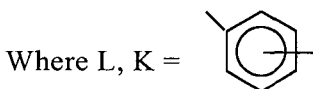
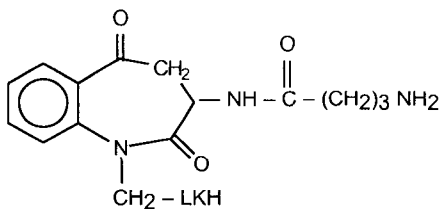


Growth hormone release promoters

- Benzofused lactams



- Benzo - fused lactams

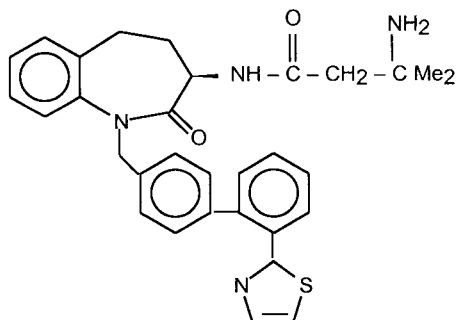


Useful as fungicide and mite ovicides. **224**

These compounds release growth hormones in humans and animals. This property has been exploited in producing efficiently the edible meat from animals. These compounds are also administered to the humans to overcome the deficiency in the production, by the body, of growth hormones. **225**

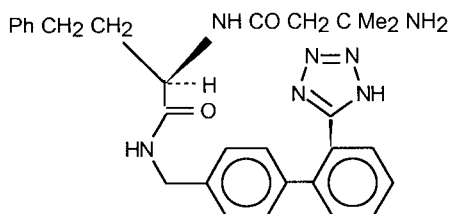
Useful as growth hormone release promoters. **226**

- Benzo - fused lactams



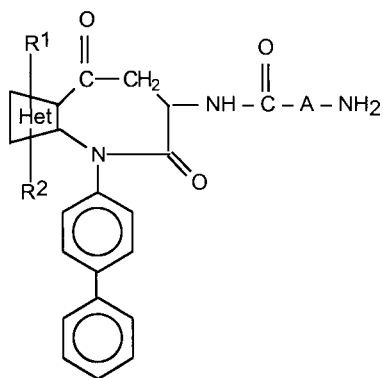
Promote release of growth hormones 227

- Substituted dipeptide analogue



Growth hormones release promoter 228

- Heterocyclic fused lactams

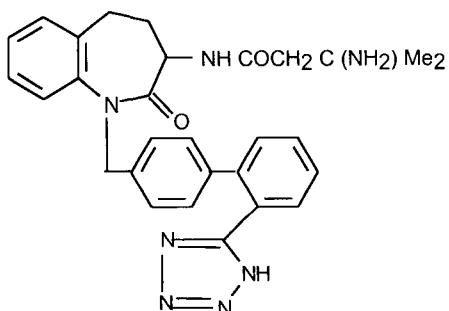


Promotes the release of growth hormones (humans) to increase stature, and in animals to render the production of edible meat more efficient. 229

A = Unsubst. C₁₋₇ alkanedinyll

R¹(R²) Het. = Disubst. 5 or 6 membered heterocycle contg. 1-3 hetero atom selected from N, O, S.

- 3- Substituted benzazepinone



Stimulates release
of growth
hormones. **230**

Antagonists

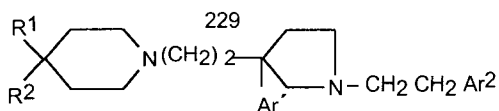
- Triptophylphenylalanine derivatives

Useful as tachykinin
antagonists
for treating
asthma. **231**

- 5-Chloro-2H-1, 2, 5- benzothiadiazine - 3
(HH) - one -1, 1- dioxide

Non - competitive
NMDA receptor
antagonist **232**

- Substituted (pyrrolidin-3-ylalkyl)
piperidines



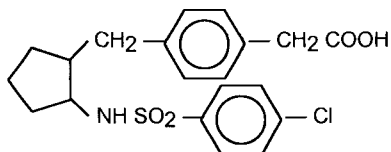
$R^1, R^2 =$ Substd. Spirocyclyl

$Ar^1 =$ Substd. aryl

$Ar^2 =$ Substd. phenyl

Tachykinin
antagonists **233**

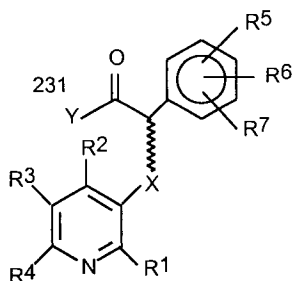
- Substituted sulfonamides



(Trans)

Thromboxane
A₂, receptor
antagonist **234**

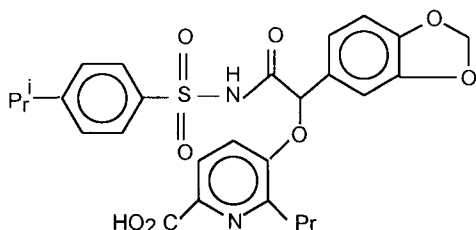
- Benzodioxide acetic acid and phenylacetic acid derivatives



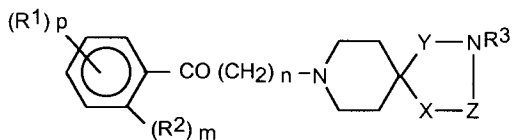
Andothelin B
receptor
antagonists

235

Example compound:



- 1, 3, 8 - Triaza and 3,8- diaza - 1- oxaspiro (4, 5) decane derivatives



As selective
5-H2C receptor
antagonists

236

Example compound:

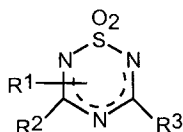
8-[5-(5-methoxyphenyl)-5-oxopentyl]-2-thio-1, 3, 8-triazaspiro [4.5] -decan-4-one.

- [(Tetrazolylpyrrolyl) benzyl] -imidazopyridines and related compounds

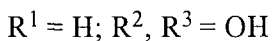
Angiotensin II
antagonists.

237

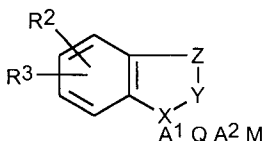
- 3- and 5- (Bicyclo ether or bicyclic alkylene thioether) alkylenamino - thiatriazines



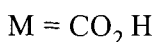
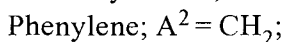
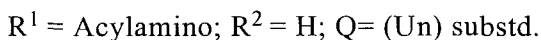
Example compound :



- Heterocyclic amide derivatives

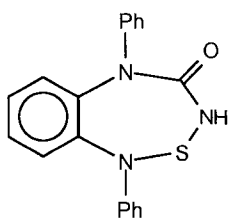
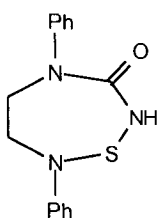


Example compound:



Inhibitors

- Thiatriazepinones

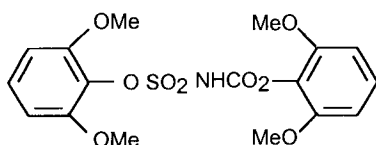


Show histamine H_2 - receptor antagonism and antiulcer activity. **238**

Useful as leukotriene antagonists **239**

These compounds are diuretics, carbonic anhydrase inhibitors. **240**

- N-(Aryloxysulfonyl) carbamates & analogues

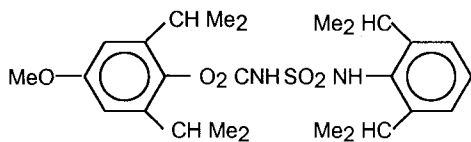


Inhibitors of cholesterol acyltransferase - therefore useful as anti-atherosclerotics and anticholesteremics. **241**

- Arylamino sulfonyl Carbamates



Example compound:



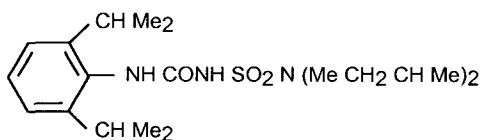
As cholesterol
acyltransferase
(ACAT
inhibitors)

242

- Aryl aminosulfonyl Urea



Example compound:

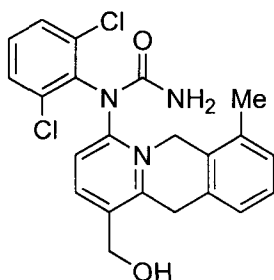


ACAT inhibitor

243

- Pyridyl Aryl Urea

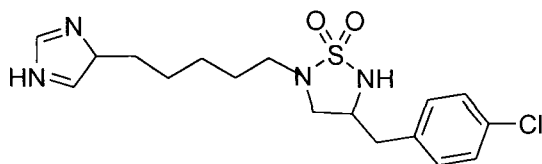
Example compound:



p38 kinase
inhibitor

244

- Imidazole derivatives



Histamine H3 receptor
ligands **245**

- N-(Aryloxy sulfonyl) Urea derivatives



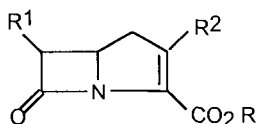
Example compound:



Ph¹ = Substituted phenyl

Useful as
ACAT
inhibitor **246**

- 7-Oxo -1- azabicyclo [3.2.0] hept -2-ene
carboxylic acid esters and their derivatives

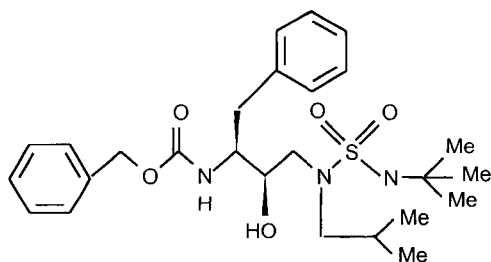


Example compound:

R = Ester function; R¹ = R² = H

Exhibits
β-lactamase
inhibitory
activity against
Enterobacter p99. **247**

- Sulfonyl alkanoylamino - hydroxy
ethylamino sulfamic acid

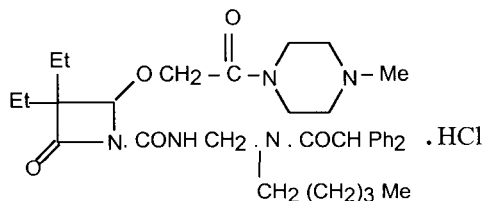


Effective as
retroviral protease
inhibitor and in
particular as
inhibitors of HIV
protease. **248**

- Pyrrole derivatives

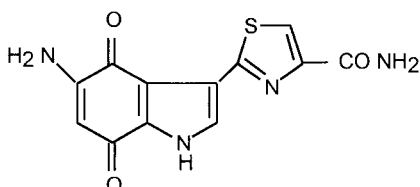
Inhibitors of TNF;
useful as anti-
retroviral agents **249**

- Azetidinone Compounds



Elastase inhibitors **250**

- Synthesis of naturally occurring indolequinone BE10988



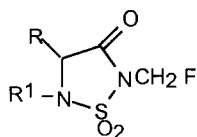
Inhibitors
of
topoisomerase II **251**

- Disopropylphenyl sulfonyl analog

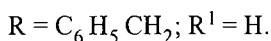
Highly selective
inhibitor of ACAT
(Hypocholesterolemic
agents) **252**

- Substituted 3-oxo-1, 2, 5- thiadiazolidine 1, 1-dioxide

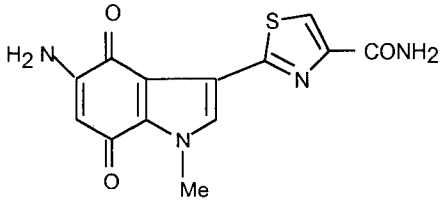
Potential inhibitors
of human leukocyte
elastase and
cathepsin G. **253**



Example compound:

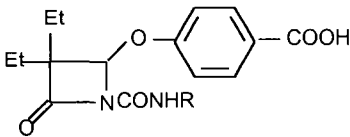


- Indolequinone BE 10988



Inhibitor of
topoisomerase **254**

- 3,3 Diethyl - 2- azetidiones



As highly stable
inhibitors of
human leukocyte
elastase inhibitors **255**

- Inhibitors of GDP - mannose
dehydrogenase of *Pseudomonas*
aeruginosa mucoid stains

Guanosine, 5' amino - 5¹- deoxyguanosine,
5¹-(3- hydroxyphenyl) - amino -5¹- deoxy-
guanosine

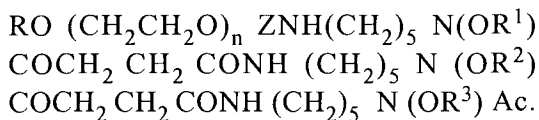
GDP- mannose
dehydrogenase
inhibitors **256**

- Benzocycloalkyl amines

Inhibitors of HIV
Protease **257**

Chelation & diagnostics

- Polyethylene glycol Carbamates.



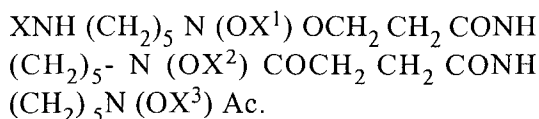
R = C₁₋₄ alkyl; R¹⁻³ = H; acyl group;

Z = - CO (NH₂SO₂)_m

m = 0, or 1

n = average value ≥ 9

- N- Acyl-desferrioxamine B derivatives



X = Org. acyl group.

X¹, X², X³ = H;

- Porphocyanine and cnc-expanded porphyrins

Useful as chelating and diagnostic agents.

258

Useful as chelating agents in treating diseases associated with excess Fe (III).

259

These compounds are useful in photodynamic therapy and diagnosis. The metalated forms when the metal is paramagnetic are useful as MRI contrast agents.

260

Miscellaneous activities

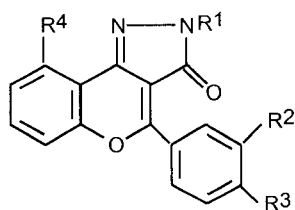
- Pyrazinobenzothiazine derivatives and analogs

Example compound :

(Syn) -3 (10H-Pyrazino [2,3-b] [1,4] benzothiazin-8-yl-methyl) -3- azabicyclo [3,3.1] nona -9-yl acetic acid

Useful in the treatment and prevention of inflammatory immunol. diseases, autoimmune diseases, rheumatism, collagen disease, asthma, nephritis, ischemic reflow disorders, psoriasis, atopic dermatitis or rejection reactions following organ transplantation. **261**

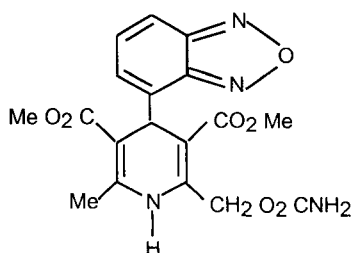
- Benzoyrano [4, 3-c] pyrazolones



Example compound:

$R^1 = R^2 = H$; $R^3 = R^4 = Cl$.

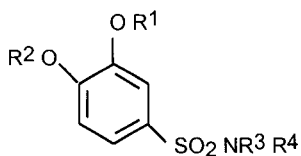
- 4-(2, 1, 3-benzoxadiazol -4-yl) - 2- Carbamoyloxymethyl - 1, 4-dihydropyridine - 3, 5- dicarboxylates



Useful as immunomodulators, especially active as immunosuppressants-useful for the treatment of e.g.; kidney rejection, rheumatoid arthritis, psoriasis and melanoma. **262**

Exhibit smooth muscle relaxant activity (rabbit). **263**

- 3, 4-Disubstituted benzenesulfonamide



Example compound:

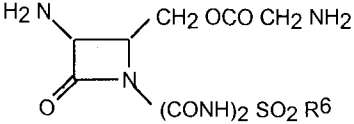
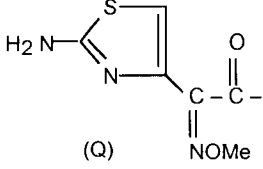
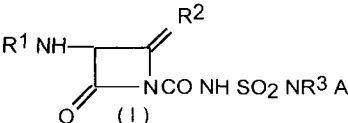
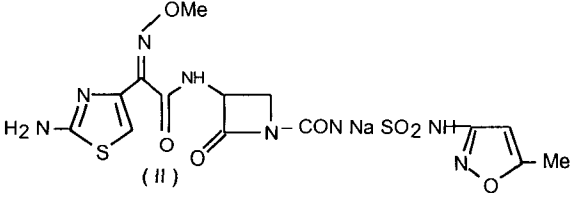
N- (indan-1- yl) -3, 4-
dimethoxybenzenesulfonamide

- Substd. 2-acylaminopyridines

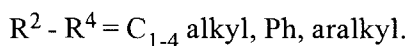
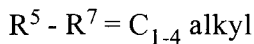
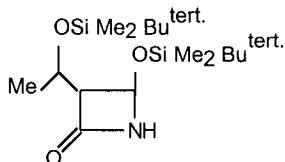
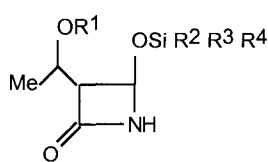
Useful in
therapeutics
(or have
therapeutic
utility). **264**

Useful in the
treatment of
nitric oxide
synthase
mediated
diseases and
disorders. **265**

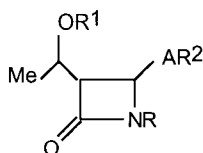
II-5 Antibiotics

General Name & Structure of Compound	Applications	Ref.
<p>Azetidinones</p> <ul style="list-style-type: none"> N-Substituted Sulfonylamino - carbonyl azetidinone derivatives  <p>$R^6 = [\text{Pyridinoyl - carbonyl amino}]$ imidazolidinone Q</p>  <p>(Q)</p> <ul style="list-style-type: none"> Isoxazolylamino sulfonylamino carbonyl azetidinones <p>General structure</p>  <p>(I) (General Structure)</p> <p>Example compound:</p>  <p>(II)</p>	<p>Antibacterial agent 266</p> <p>Antibacterial agent 267</p>	

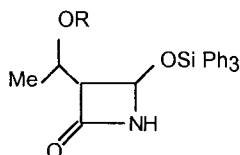
Azetidinones



- 4-Mercapto - or - hydroxy - 3 - (1-hydroxy-ethyl) azetidin -2 - one derivatives

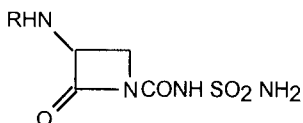


Example compound:



R = Hydroxy protecting group

- N-(Sulfonamido carbonyl) azetidinones



R = Carboxylic acid derived acyl

Intermediates for antibiotics

268

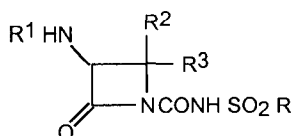
Used as intermediates for β -lactam antibiotics.

269

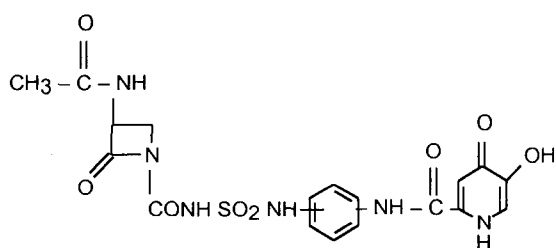
As antibacterial agent

270

- 2-Oxo-1-[(Substituted sulfonyl) amino carbonyl] azetidine



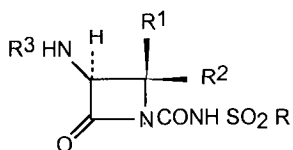
Example compound:



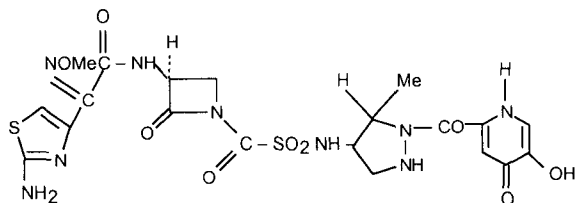
Antibacterial

271

- N-[(Heterocyclylsulfonyl) carbamoyl] azetidinones

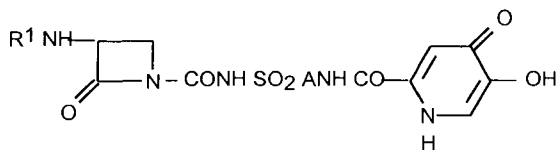


Example compound:

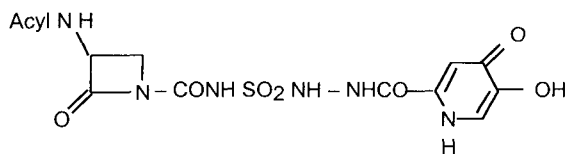


Antibacterial agent 272

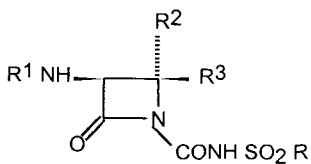
- 1-(Aminosulfonylamino) azetid-2-ones



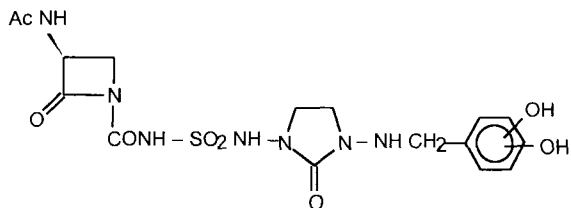
Example compound:



- 2-Oxo-1-[(subtd. sulonylamino] carbonyl azetidines



Example compound:



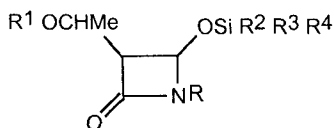
Antibiotic

273

Antibacterial

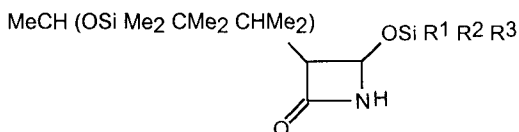
274

- 3-(1-hydroxyethyl -4- (tert.-silyloxy) azetid-2-ones

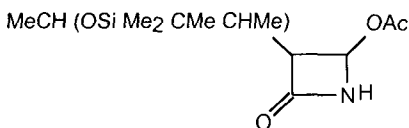


R = H; R¹ = Hydroxy protective group;
R² - R⁴ = C1 - 6 alkyl, Ph, aralkyl

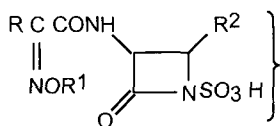
- Azetidinone derivatives



Example compound:

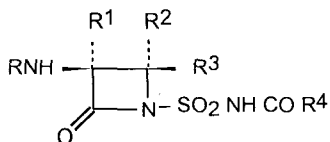


- 1-Sulfo-2-oxoazetidine carboxylic acid derivatives



R = Amino - substd. 5-or 6-membered heteroaryl contg. 1-2 N and an optional S or O. R¹, R² = H

- 2-Oxo - 1-[(acylamino) sulfonyl] azetidines.



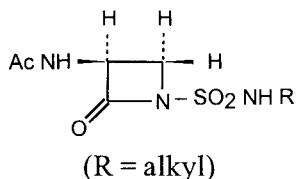
As intermediates
for bactericides **275**

Intermediates for
carbapenem
antibiotics **276**

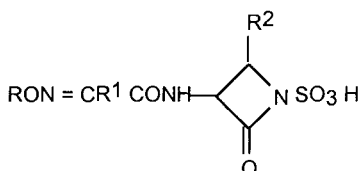
Antimicrobials:
Inhibits the growth
of micro-organism
viz, *Proteus
mirabilis* Or
P. vulgaris. **277**

Bactericidal **278**

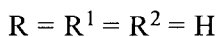
Example compound:



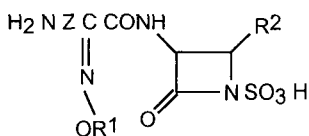
- 1-Sulfo -2- oxoazetidine derivatives



Example compound:

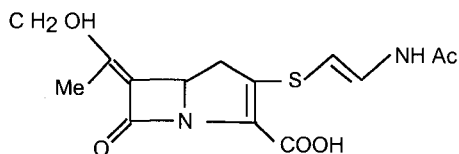


- 1-Sulfo -2- oxoazetidine derivatives



$z = 5$ - or 6 - membered arom., 1 or 2 -N-contg. optionally with addnl. O, Se or S atom; $R^1 =$ substd. alkyl., $R^2 = H$, Org. group., oxime group at least partly syn.)

- 3-(1-methylethylidene) - 4- acetoxy - azetidinones



Bactericidal

Inhibits

Proteus mirabilis 279

Bactericidal

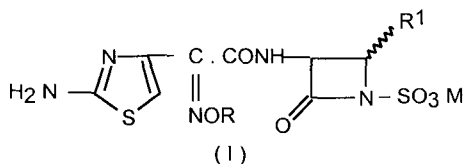
(inhibitory action against *Proteus mirabilis* 1028 and *Escherichia coli* 1346)

280

Synthesis of (\pm) asparenomicin antibiotic

281

- 4-(Subst. methyl)-2-azetidone-1-sulfonic acid derivatives. (Synthesis)

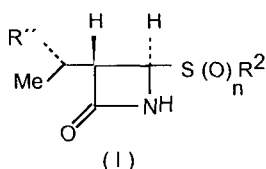


Highly potent antibacterial activity against Gram-negative bacteria including *Pseudomonas aeruginosa*.

282

Modified derivative of sulfazecin

- Sterically uniform 2-azetidones



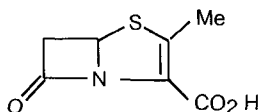
Useful as intermediates for penems and Carbapenems (antibiotics).

283

$R'' = H$; acyl, trialkyl silyl,

$R^2 = Ph$ subst. in o - and (or) p - position by halo, alkyl, alkylthio, alkoxy; $n = 0, 2$].

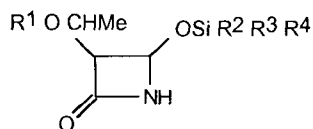
- 4-Thiazetidone



Bactericidal activity

284

- 3-(1-hydroxyethyl)-4-siloxyazetidone-2-ones

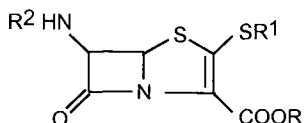


Intermediates for thienamycin antibiotics

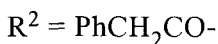
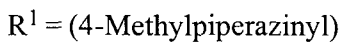
285

Azabicyclo [3.2.0] heptenones

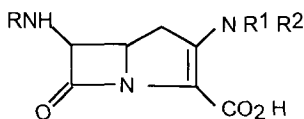
- 6-Amino- 3-subst. amino -1- azabicyclo [3.2.0.] hept -2- ene -7- one -2- carboxylic acid

Antibiotic **286**

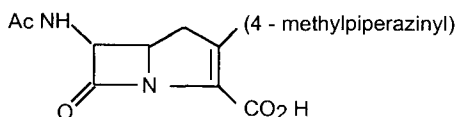
Example compound:



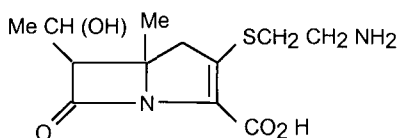
- 6-Amino -3- subst. amino -1- azabicyclo [3.2.0.] hept -2- ene -7- one -2- carboxylic acid

Antibiotic **287**

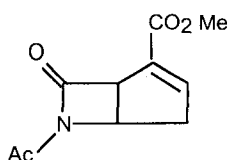
Example compound:



- 5-Substituted -3- (2-aminoethylthio) -6- (1-hydroxy ethyl) -7- oxo -1- azabicyclo [3.2.0.] hept -2- ene carboxylic acid

Antibiotic &
bactericide **288**

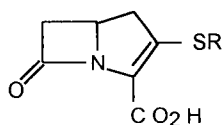
- 6-Azabicyclo [3.2.0.] hept-2- ene derivatives



Potential
antibacterial
agents

289

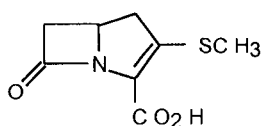
- β -Lactams (Azabicycloheptanones).



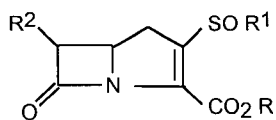
Bactericidal.

290

Example compound:

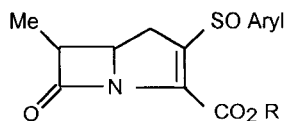


- Derivatives of 7 - oxo -1- azabicyclo [3.2.0.]
- hept -2 -ene -2- carboxylic acid

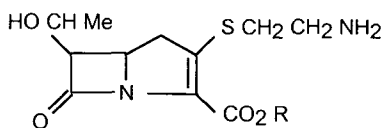


Inhibition of
Escherichia coli. 291

Example compound:



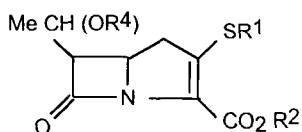
- 3-(2-Amino ethylthio) -6- (1-hydroxyethyl) -7- oxo- 1, 2-azabicyclo [3.2.0.] hept -2- ene carboxylic acid



Antibiotics

292

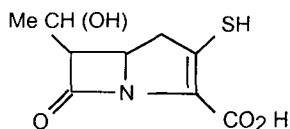
- 6-(1-Hydroxyethyl) -7- oxo -1- azabicyclo [3.2.0.] - hept -2- ene-carboxylic acid derivatives



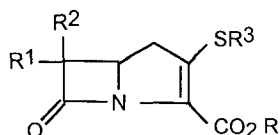
Antibiotics

293

Example compound:



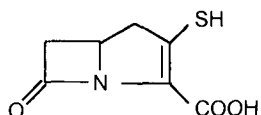
- 3-Substituted -6- substituted. 7- oxo -1- azabicyclo [3.2.0.] hept -2- ene carboxylic acid



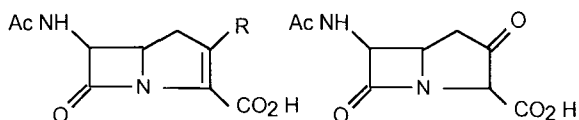
Antibiotics

294

Example compound:



- 6-Amido -3- substituted -1- azabicyclo [3.2.0.] hept -2- ene-7- one- carboxylic acid

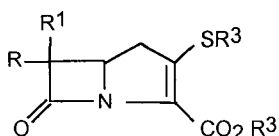


Bactericides

295

R = Cl, OAc, OMe or OCH₂CH₂NEt₂

- Substituted -6- substituted. -7- oxo -1- azabicyclo [3.2.0.] hept -2- ene- 2- carboxylic acid



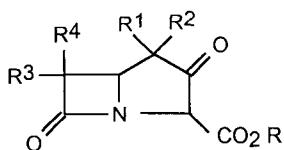
Bactericidal

296

Example compound:

R, R¹ = H; R³ = Alkyl group.

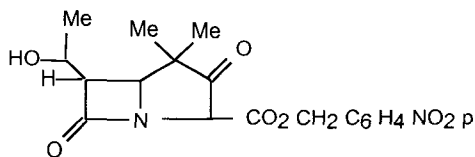
- 6-and 4-Substituted -1- azabicyclo [3.2.0.] - heptene - 3, 7- dione -2- carboxylates.



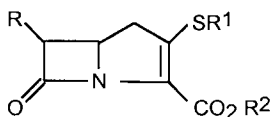
Antibiotics

297

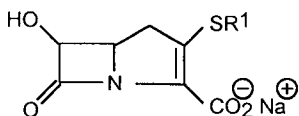
Example compound:



- β-Lactam acetic acid derivatives

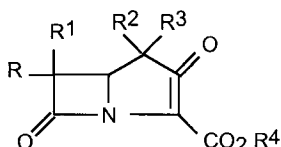


Example compound:



(R¹ = hydrocarbyl)

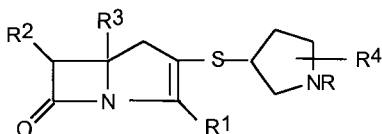
- 6-and 4-Substituted -1- azabicyclo [3.2.0.] heptene - 3, 7- dione -2- carboxylates



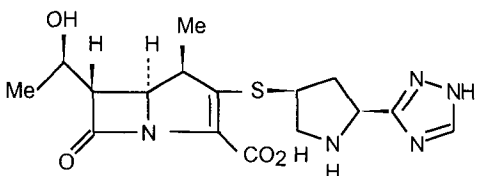
Example compound:

R = HOCHMe, R¹ = R² = H, R³ = Me, R⁴ = CH₂ C₆ H₄ NO₂-p

- 3- Pyrrolidinylthio -1- azabicyclo [3.2.0.] hept-2-ene carboxylic compounds



Example compound:



Intermediates for
1-azabicyclo -
[3.2.0.] hept -2-
ene antibiotics

298

Antibiotics

299

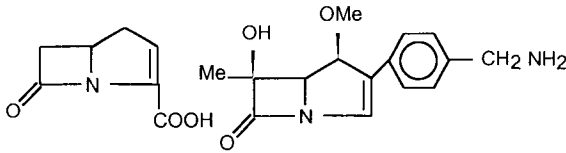
Inhibitory action
action agent

Proteus vulgaris.

300

Carbapenems

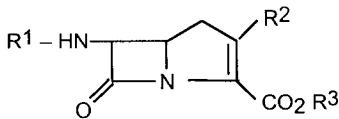
- 1, 6- and 2- subst. -1-carba-2- penem- 3 carboxylic acids



Used in
pharmaceutical
compositions

301

- 6-Amido-1- carba -2- penem -3- carboxylic acids



Antibiotics

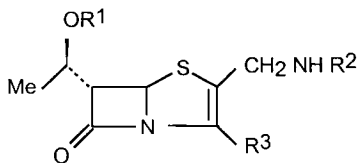
302

$R^1 = \text{Ph CH}_2 \text{ CO}$

$R^2 = \text{Unsubtd. C}_{1-4} \text{ alkyl.}$

$R^3 = \text{Trichloroethyl}$

- β -Lactam as penem and cabapenem



Antibiotics

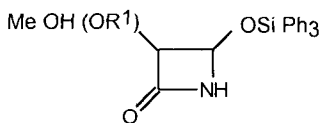
303

$R^1; \text{CH}_2 = \text{CH}-\text{CH}_2\text{O}_2\text{C.CO,}$

$R^2; \text{CO}_2 \text{ CH}_2 \text{ CH} = \text{CH Ph}$

$R^3; \text{CH}_2 \text{ CH} = \text{CH}_2$

- 3- Protected -1- hydroxyethyl - 4- (siloxy) azetidiones as carbapenem

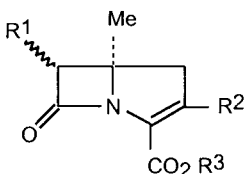


Antibiotics

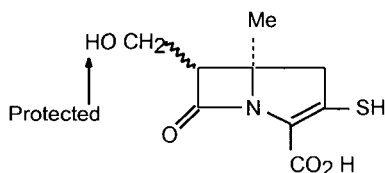
304

$R^1 = \text{Ac}$

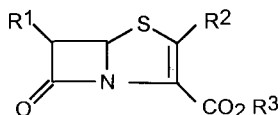
- 5- Methyl carbapenem compounds



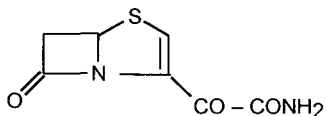
Example compound:



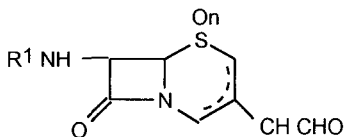
- 5 S- Penem derivatives



Example compound:



- Cephalosparin analogs



Broad spectrum
antibiotics

305

Inhibitors of the
bacterial enzyme
leader peptidases.

306

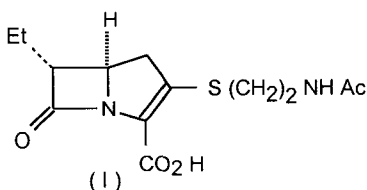
Useful against
staphylococcus
aureus in mice.

307

Antibiotics

308

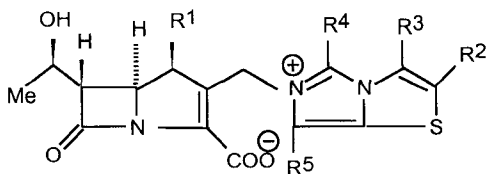
- Carbapenems antibiotics
- Synthesis of *trans*- (+) -4- carboxymethyl -3- ethyl-azetidin -2- one and it's conversion into natural carbapenem antibiotic (+) - PS-5 [I]



Antibiotics

309

- Carbapenem derivatives

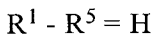


Broad and potent antibacterial activity.

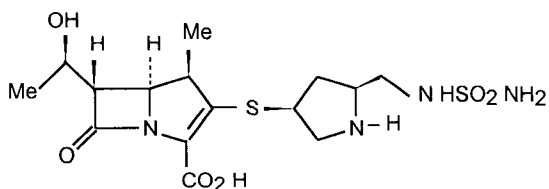
(*staphylococcus aureus* comparable to cilastatin/imipenem)

310

Example compound:



- 1 β -Methyl carbapenem antibiotic, S-4661



Antibiotic

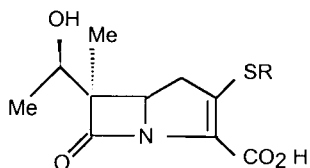
311

- β -Lactams

Useful as intermediates for the synthesis of carbapenem antibiotics.

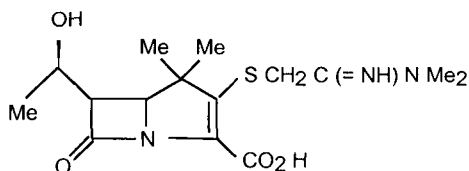
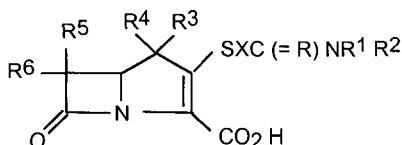
312

- 5-Methyl carbapenems



Antibacterials 313

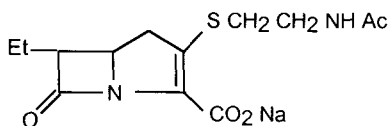
- 1-, and 1, 1-Disubstituted -6- substituted -2-carbam-imidoyl -1 -7- carbadethiapen-2-em -3 carboxylic acids



Antibiotics 314

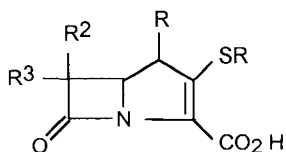
[X = bond, aliph., alicyclic, arom., heterocyclic; R - R² = H, aliph. cycloalkyl, aryl, heterocyclic and may form rings with each other or with x; R³ - R⁶ = H, (Un) subst. alkyl, Cycloalkyl, aryl, heterocyclic, R³, R⁴ = alkylene]

- Carbapenem antibiotic (±) -6- epi - PS - 5



Antibiotic 315

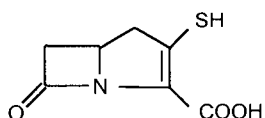
- 6-, 1- and -2 subst. 1- carbadethiapien-2-em-3- carboxylic acids



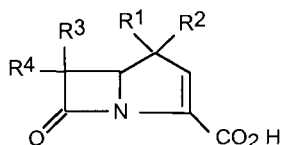
Antibiotics

316

Example compound:



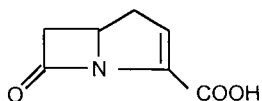
- 6-, 1, 1- disubst. 1- carbadethiapien-2-em-3- carboxylic acids



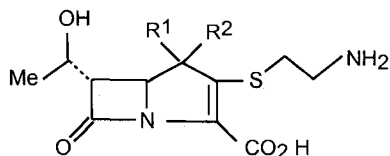
Antibiotics

317

Example compound:



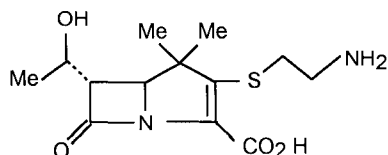
- 6-(1- hydroxyethyl) -2- (2- amino-ethylthio)-1,1- disubstituted -1- carpede thiapien -2- em -3- carboxylic acids



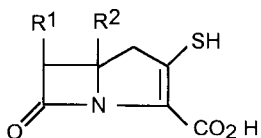
Antibiotics

318

Example compound:



- 2-, 5- and 6- Subst.-1- carbadethiapien -2- em- carboxylic acids

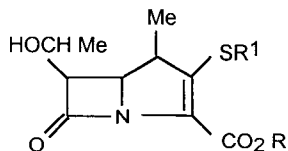


Antibiotics

319

$R^1 = R^2 =$ optionally subst. hydroxy alkyl.

- 6-(1- Hydroxyethyl) -2- (Subst. mercapto)- 1- methyl -1- carbadethiapien-2- em -3- carboxylic acid esters



Antibiotics

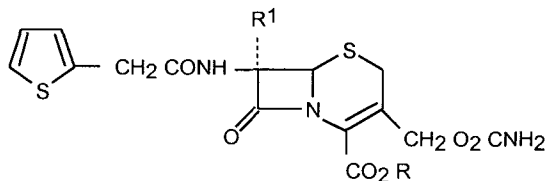
320

R = Ester,

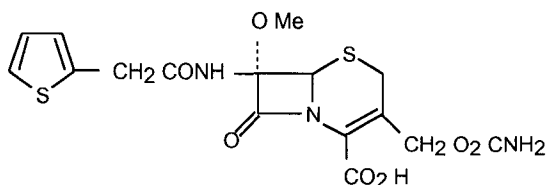
$R^1 =$ Un (Subst.) alkyl, alkenyl, alkynyl, Cycloalkyl, Ph, pyridyl

Cephalosporins

- Cephalosporin compounds:



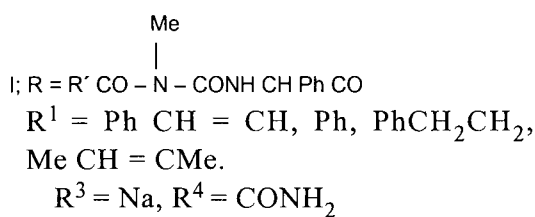
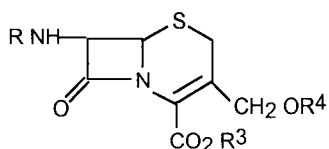
Example compound:



Antibiotics

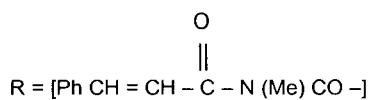
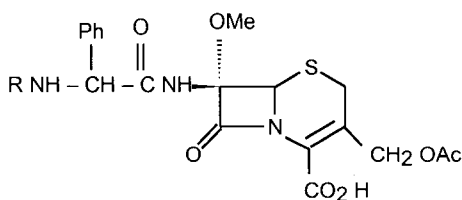
321

- Cephalosporins



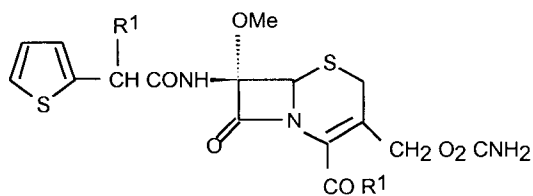
Broad spectrum
antibiotics **322**

- Cephalosporin



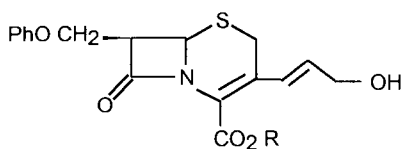
Antibiotic - active
against *Serratia*
lutea. **323**

- Cephalosporin Compounds



Useful as
bactericidal
agents. **324**

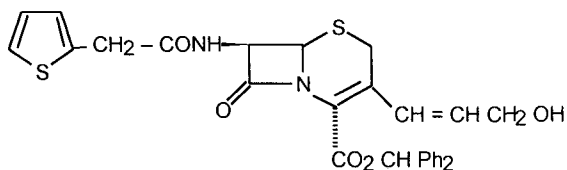
- 3-Propyl derivative of cephalosporin



(R = alkyl)

Useful as an
antibiotic. **325**

Example Compound:



- Cephalosporin derivatives

Cephalosporin molecule

Antibacterial **326**

Example compound:

$R^1 = H; R^2 = Ph.$

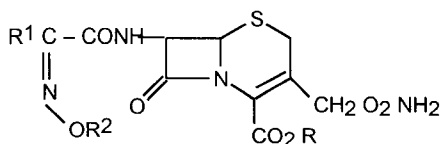
- Cephalosporins

Example compound:

7 β -[(z)-2 (2-tert. butoxy carbonylamino -4- thiazolyl) -2- pentanoylamino] -3- carbamoyloxymethyl -3- cephem -4- carboxylic acid

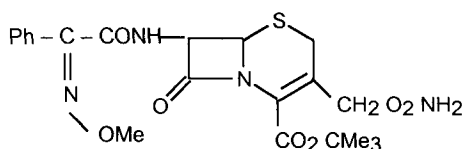
Antibiotics **327**

- Cephalosporin derivatives

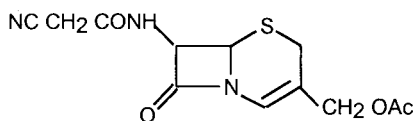


Antibiotics **328**

Example compound:



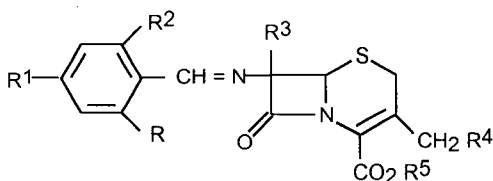
- Cyanoacetamidocephalosporanates



Antibiotics

329

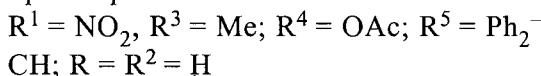
- 7- (or 6) - Substituted -7- (or 6) benzylideneamino cephalosporin (or penicillin) compounds



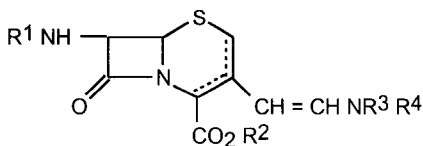
Bactericides

330

Example compound:



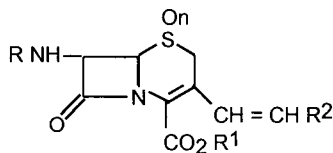
- 3-Vinylcephalosporin analogs



Useful as bactericides against *staphylococcus aureus*.

331

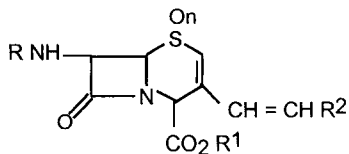
- 3-Vinylcephalosporins



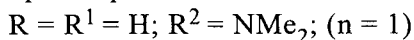
Active against penicillin G-sensitive

Staphylococcus aureus.

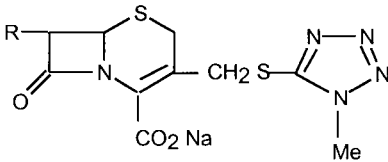
332



Example compound:

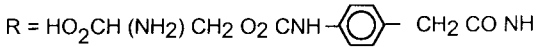


- Intermediate products for cephalosporin

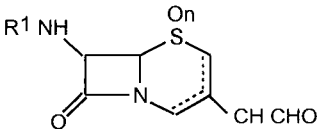


Antibiotics

333

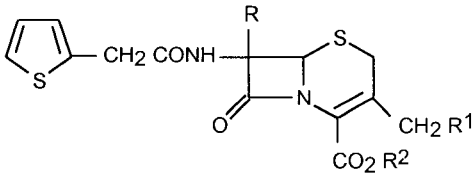


- Cephalosporin analogs

Useful against
staphylococcus aureas.

334

- Semi - synthetic Cephalosporins

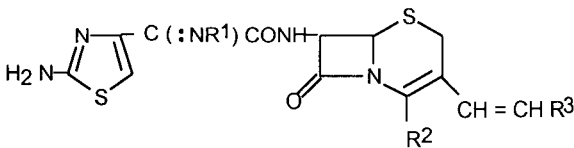


Antibiotics

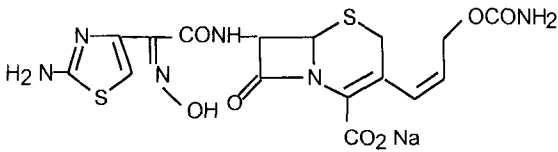
335

R = H, MeO; R¹ = OAc, Pyridino, 4- (amino carbonyl) Pyridino

- 3-Substd. vinyl cephalosporin derivatives.

Useful as
antibacterial
against
staphylococcus aureas,
Escherichia coli,
Klebsiella Pneumoniac,

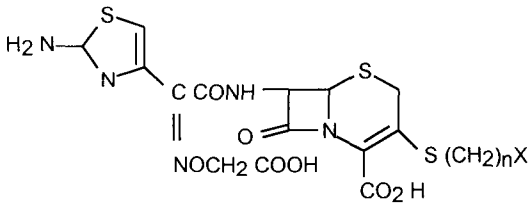
Example compound:



Serratia morcescens and
Morganella morgani.

336

• Cephalosporin

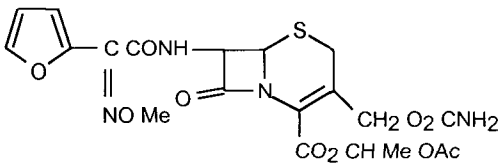


Oral antibacterial
(Inhibits the growth
of *Escherichia coli*).

337

(n = 2; X = H₂ NCO₂) Na

• Cephalosporins

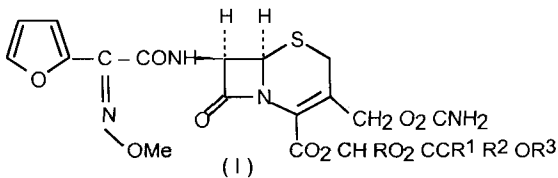


(Cefuroxime axetil)

Antibiotics

338

• Cephalosporin antibiotics



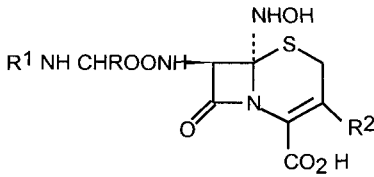
Improved oral
cephalosporin
type antibiotics

339

Example compound:

(z) I (R = H; R¹ - R³ = Me)

- Cephalosporin antibiotics



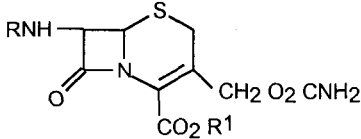
Antibiotics 340

[R = (Un) subst. Ph, cyclohexenyl, CH₃⁻ CH (OH), heterocyclyl etc.,

R¹ = CONR⁴ R⁵, etc.; R⁴ = H, C₁₋₄ alkyl; R⁵ = R⁴, (Un) subst.

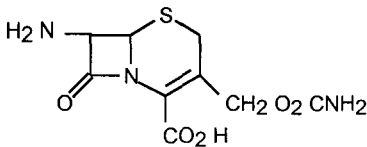
heterocyclyl etc., R² = CH₂ OCO Me, CH₂⁻ OCONH₂, Cl, F, OMe etc.

Cephems

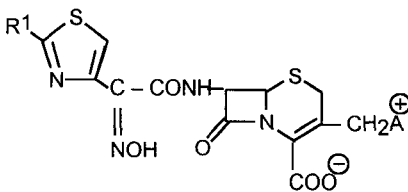


Antibiotic activity 341

Example compound:



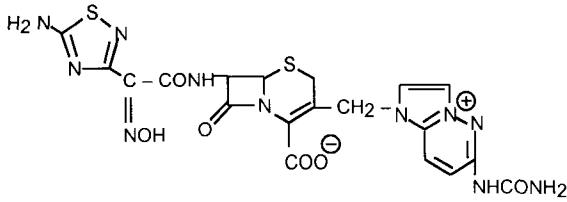
- Cephem compounds:



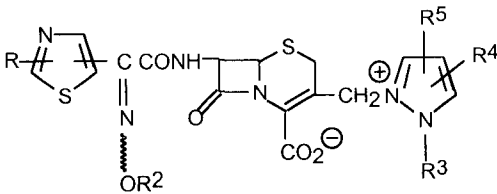
(*In Vitro*) Bactericidal
action against
Staphylococcus
aureus.

342

Example compound:

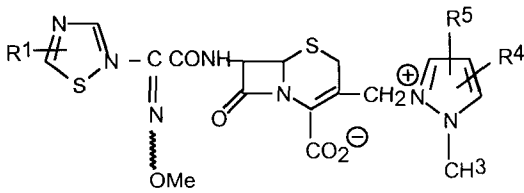


• Cephem compounds:

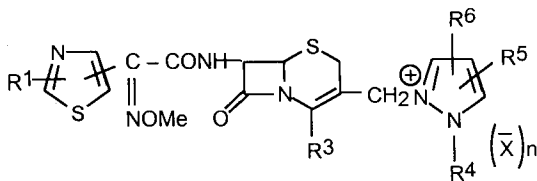


Example compound:

$R^1 = R^4$ Protected amino group



• (Pyrazolomethyl) Cephemcarboxylates



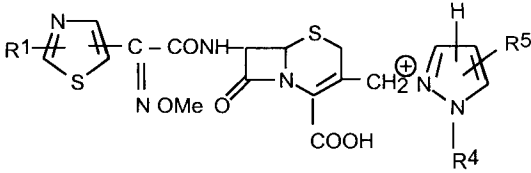
Inhibitory
action
against
*Escherichia
coli.*

343

Useful as
antibiotics

344

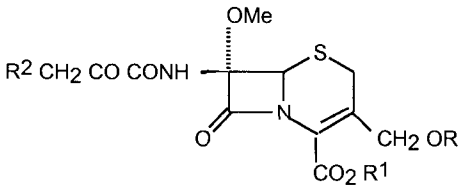
Example compound:



$R^1 = R^5 =$ Protected amino;

$R^4 =$ (Protected) hydroxyl (Lower) alkyl

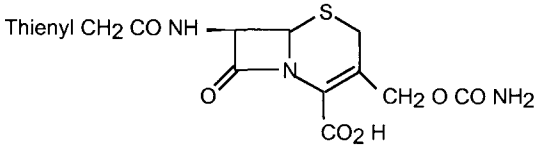
- 3 [(Carbamoyloxy) methyl]-7a-methoxy-7 (acylamino)-3- cephem-4-carboxylic acid



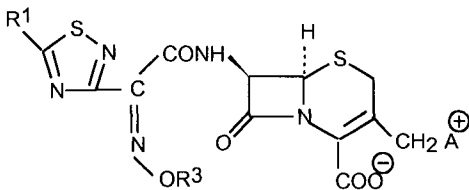
Antibiotics

345

Example compound:



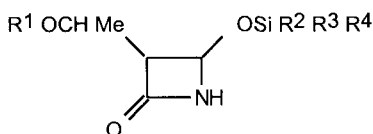
- Cephem derivatives



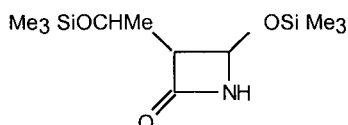
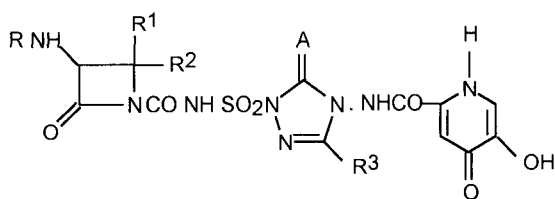
Exhibits antibiotic action against *Staphylococcus aureus*.

346

$R^1 =$ (Un) protected amino; $R^3 =$ fluoroalkyl;
 $A^+ =$ hetero-cycliumyl

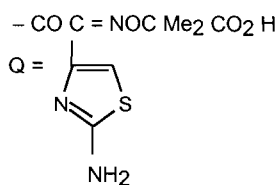
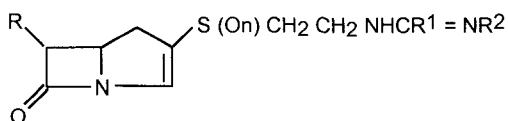
Beta Lactams

Example compound:

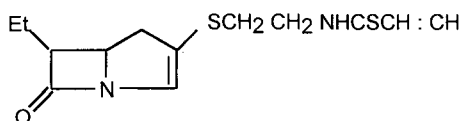
• N-1 Substd. β -lactams

Example compound:

$R = Q$; $R^1, R^2, R^3 = H$; $A = O$

• β -Lactam derivatives

Example compound:



Antibiotics

347

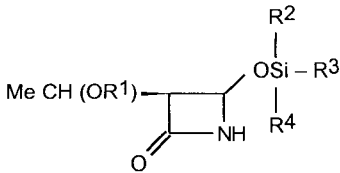
Antibiotics

348

Inhibitory activity towards *staphylococcus aureus*.

349

- β -Lactam Compounds



$R^1 =$ trialkylsilyl; $R^2, R^3, R^4 = C_{1-4}$ alkyl, Ph, aralkyl

Useful as intermediates in preparing β -lactams.

350

Penems

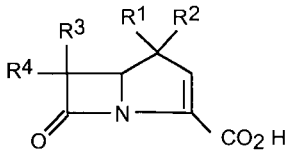
- Penem antibiotics (Preparation of intermediate - carbamoyloxy-acetic acid (or its esters))

Antibiotics

351

$NH_2 - CO_2 - CH_2 - COOH$

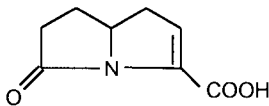
- 1, 1-Disubstituted - pen-2-em-3-carboxylic acids



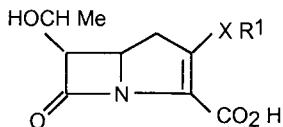
Antibiotics

352

Example compound:

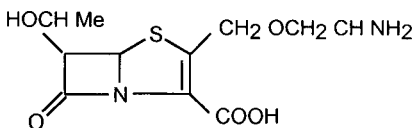


- 2, 6-Disubstituted Penem Compounds



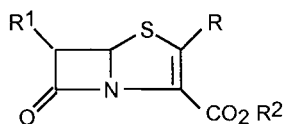
Inhibitory action against *Staphylococcus aureus*.

Example compound:

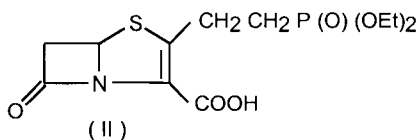
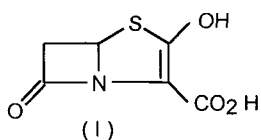


353

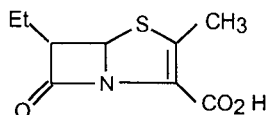
- Penem Compounds



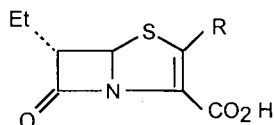
Example compound:



- 6-Alkyl -2- penems



- 6-Ethyl -2- penem derivatives



R = Me, CH₂OAc, CH₂ CH₂ OAc

II is claimed to have a minimum inhibitory conc. against *staphylococcus aureus* A 9573 of 1mg/mL.

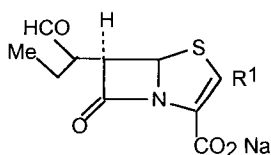
354

Inhibitory action against *Staphylococcus aureus*.

355

Antibacterial activity against Gram-positive bacteria comparable to that of cefoxitin. **356**

- 5, 6-*Cis* - Penems :



$R^1 = \text{Ph}$.

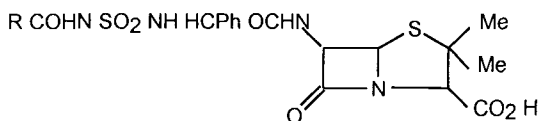
Broad - spectrum
Anti-Methicillin
Resistant
Staphylococcus aureus (MRSA)
 β -lactam antibiotics.

Also active against
a wide variety of
bacteria including
 β -lactamase
producing micro-
organisms.

357

Penicillins

- N-Sulfamylampicillins

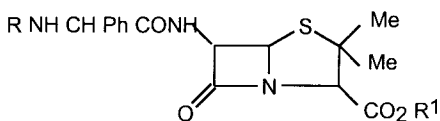


$R = \text{Alkyl, Aryl, Substd. amino, N-}$
 heterocyclic

Antibiotics

358

- Penicillanic acid and cephalosporanic acid derivatives



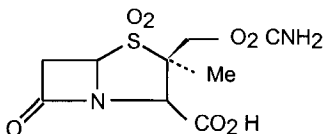
Antibiotics

359

Example compound:

$R = \text{Me}; R^1 = \text{H}$

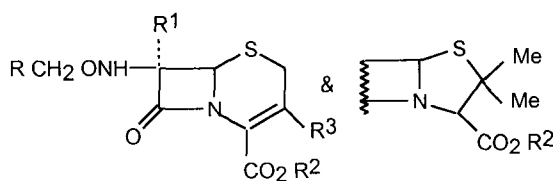
- 2 β -Carbamoyloxy - methyl penicillanic acid sulfone derivatives



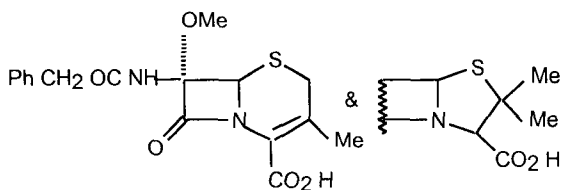
Useful as
 β -lactamase
inhibitor.

360

- Benzhydryl-3- (carbamoyloxy -methyl). (acylamino) -7- methoxy - decephalosporanates and benzyl - 6- methoxy -6- (phenyl acetamido) penicillates

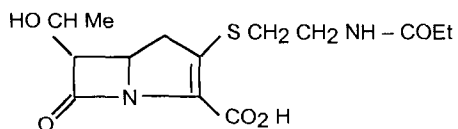


Example compound:

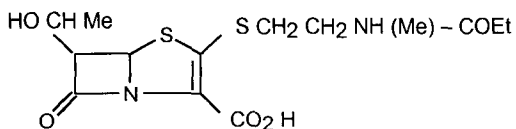


Thienamycins

- N-acyl derivatives of thienamycin



- N- and carboxyl derivatives of thienamycin



Antibiotics

361

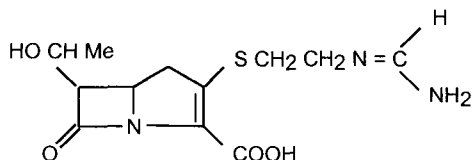
Used in drugs.

362

Antibiotic

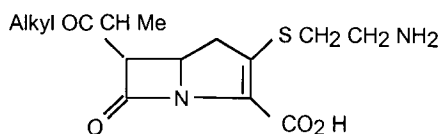
363

- N-methylene derivative of thienamycin.



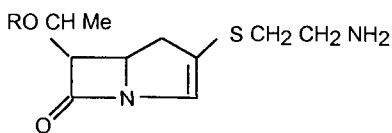
Antibiotic 364

- *o*-Derivatives of Thienamycin



Antibiotic activity 365

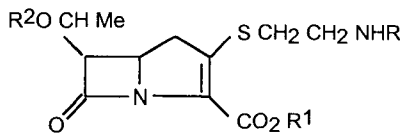
- Thienamycin derivatives



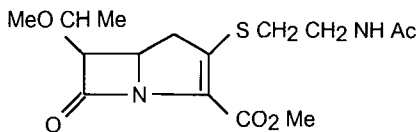
Antibiotic activity 366

(R = alkyl.)

- Thienamycin derivatives

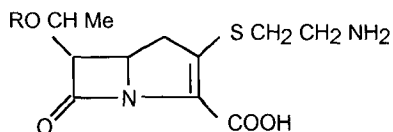


Example compound:



Antibiotics 367

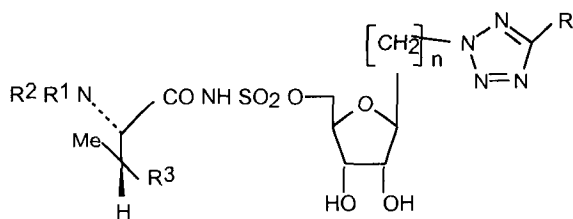
- o-Derivatives of Thienamycin



R = alkyl, Acyl, Aralkyl, alkenyl, alkynyl

Miscellaneous antibiotics

- Aminoacyl adenylate



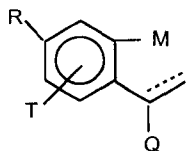
R = amino, alkyl, aryl, cycloalkyl, alkoxy, aryloxy;

R¹, R² = alkyl, aryl, carboalkyloxy, alkylthiocarbonyl, carboxamido, acyl;

R³ = Et, OMe,;

n = 1, 2

- (Aminoalkyl) - substituted benzo-heterocyclic compounds



Antibiotics

368

Useful as microbial and antiparasitic agents such as multidrug resistant *Streptococcus pyogenes*.

369

Antimycotic and antihypercholesteremic activities

370

Dotted line = optional double bond;

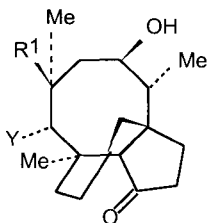
M = (Un) subst. Heterocyclic atom grouping;

Q = (Un) Subst. Cycloalkyl, (Un) Subst. alkenyl, (Un) Subst. alkadienyl, (Un) Subst. H (aminoalkyl) phenyl etc.,

R = (Un) Subst. aminoalkyl

T = H, alkyl, (Un) Subst. NH_2 , CONH_2 , NO_2 , CF_3 , OH.

- Carbamoyloxy derivatives of Mutilin



Example compound:

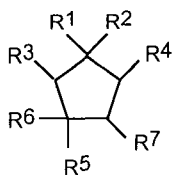
$\text{R}^1 = \text{Et}$; $\text{Y} = (\text{Un})$ subst. Carbamoyloxy

- Cyanoacetanilide derivatives

HOCMe : $\text{C}(\text{CN})\text{CONHR}$

R = Subst. Phenyl

- *Cis* - Substituted cyclopentylamine



$\text{R}^1, \text{R}^2 = \text{H}$, halogen, Cycloalkyl, (Un) branched (Un) subst. Alkyl;

$\text{R}^3, \text{R}^4 = \text{halogen}$, (Un) subst. alkyl or cycloalkyl;

Useful for the treatment of bacterial infections.

371

Analgesic and anti-inflammatory

372

Associated with antimycotic activity. (Useful in the treatment of fungal infections).

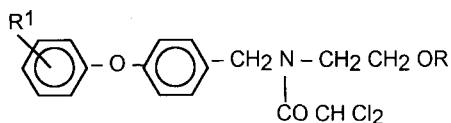
373

$R^5 = H, \text{ alkyl};$

$R^6 = H, \text{ alkyl, phenylalkyl};$

$R^7 = (\text{Un}) \text{ subst. phosphonate, } (\text{Un}) \text{ subst. } \text{CO}_2 \text{ H}$

- Substituted -N- (β -alkoxy ethyl) -N- (4-phenoxy) dichloroacetamide



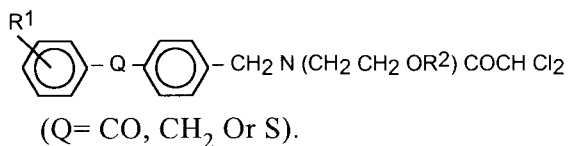
Inhibitory activity against *Entamoeba histolytica*.

374

Example compound:

$R^1 = \text{H}_2 \text{ N}; R = \text{CH}_3.$

- Substituted N- (β -alkoxy ethyl) -N-benzyl dichloroacetamides



Amoebicidal activity

375

Example compound:

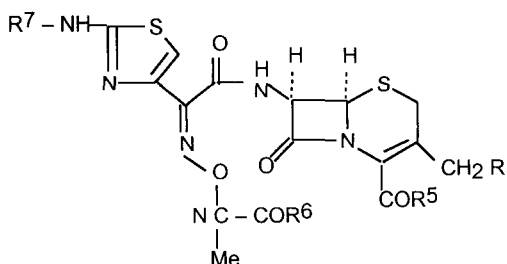
$R^1 = \text{NO}_2; R^2 = \text{Et}; Q = \text{CO}.$

- 1, 3-Dioxane and -dioxins

Useful as intermediates for the synthesis of carbapenem antibiotics.

376

- Imidazo [5, 1-b] thiazole derivatives

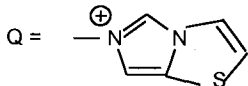


Intermediates for antibacterial cepheps

Inhibits the growth of *staphylococcus aureus*.

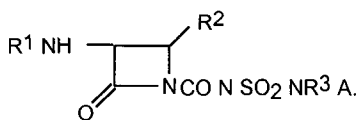
377

Example compound:

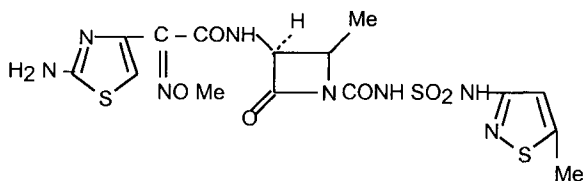


R = Q; R5 = \bar{O} ; R6 = OH; R7 = H

- Isothiazolyl β -lactam

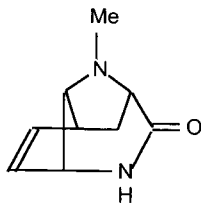


Example compound:



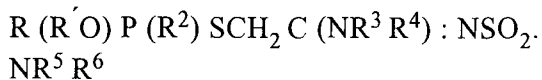
Antibacterial
agent, *in vitro*
(*Escherichi coli*). 378

- (\pm) Naphthyridinomycin - total synthesis



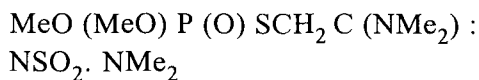
Quinone
antibiotic 379

- Phosphorathioates

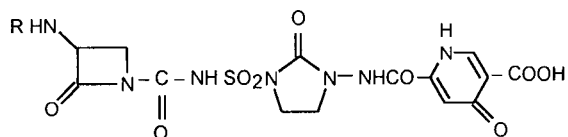


Acaricidal and
insecticidal 380

Example compound:



- Pyridone Carboxylate Containing β -lactam.



As an
antibacterial
agent.

381

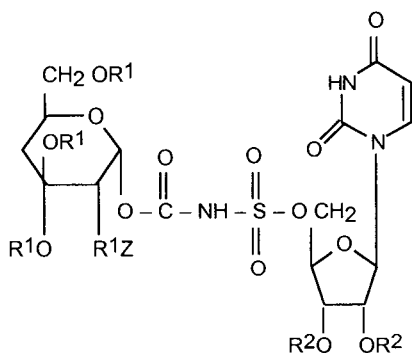
R = COOH derived acyl.

- 1-Aryl-1,2,3-triazolo [4,5e] pyrimidines

Exhibits
bactericidal
activities against
B. subtilis and
S. aureus.

382

- Analogs of Uridinediphosphate hexoses



Protein glycosilation
inhibitors

Exhibit antiviral activity;
particularly active
against several
enveloped viruses.

383

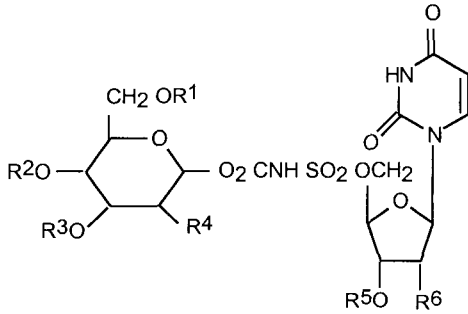
($R^1 = \text{PhCH}_2$; Bz; Ac; palmitoyl, $R^2_2 = \text{Me}_2\text{C}$;
Z = O; $R^1 = \text{Ac}$, $R^2_2 = \text{Me}_2\text{C}$; Z = NH)

- Carboxylsulfamide derivatives

Bacteriostatic
activity
evaluated

384

- 5¹-O- [Hexoyranosyloxy carbonyl) sulfamoyl]- Uridines



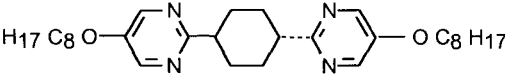
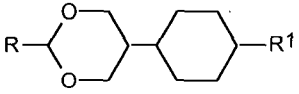
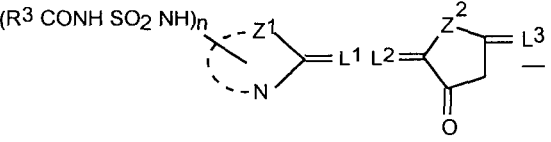
Useful as
virucides.

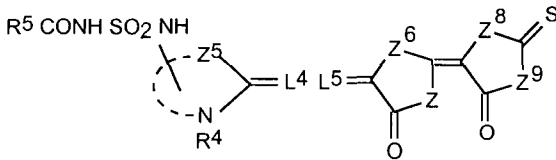
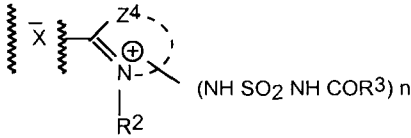
385

Example Compound:

$R^1, R^2, R^3 = \text{Ph CH}_2, R^4 = \text{OCH}_2 \text{ Ph}, \text{OR}^5,$
 $R^6 = \text{iso-propylidene dioxy}$

II-6 Miscellaneous Applications

General Name & Structure of Compound	Applications	Ref.
<ul style="list-style-type: none"> • <i>Trans</i> - 2, 2¹ (1, 4- Cyclohexanedryl) bis (pyrimidine) derivatives 	Used in neumatic or ferroelectric liquid crystals.	386
<ul style="list-style-type: none"> • Oligothiophene - based liquid crystals. Asym. Substd. oligothiophene, 2-cyano -5- octyl quarter thiophene.	Material useful for optical properties.	387
<ul style="list-style-type: none"> • Cyclohexyl dioxanes  <p>(R = C₁₋₁₂ alkyl, alkoxy or alkoxyalkoxy; R¹ = CN, F Cl or Br)</p>	Liquid crystals dielects. for use in electro-optical display devices.	388
<ul style="list-style-type: none"> • Disulfamate diureides RNHCONHCO(X)CONHCONHR	Demonstrated sustained release fertilizer activity.	389
<ul style="list-style-type: none"> • Merocyanine based spectral sensitising dye for photographic material 	Dye for photographic material	390



Z¹⁻⁹ = at group to form 5 or 6 membered N containing heterocycle; R¹⁻⁶(substd) alkyl; L¹⁻⁵ substd. C₁₋₃ methine unit; m, n = 0, 1; m = n ≠ 0]

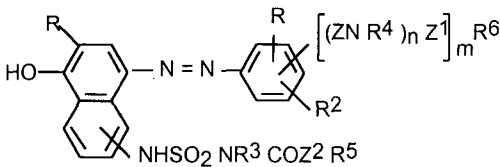
- Silver Halide recording material for generation of negative images with ultrahigh contrast.

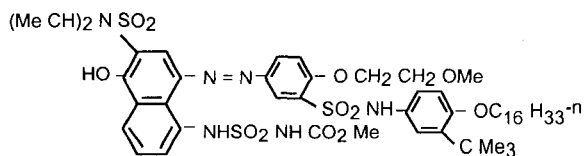
Booster (Contrast increasing compound) R¹ R² XSR; R¹ R² NXSXIN R³ R⁴ and R¹ R² NSX² SX¹ NR³ R⁴ (R¹⁻⁴ = C₁₋₆ alkyl, benzyl, R¹-R² and/or R³ - R⁴ may form 5-12 membered ring; x, x¹, x² = divalent connection group, R = alkyl, aralkyl, aryl, S = SO₂ NR⁵ CON R⁶; SO₂ NR⁷ COO, NR⁸ SO₂ NR⁹; R⁵⁻⁹ = H, C₁₋₆ alkyl, benzyl)

For manufacturing black and white negative images with ultra high contrast.

391

- Photographic photosensitive units containing azodye-forming compounds

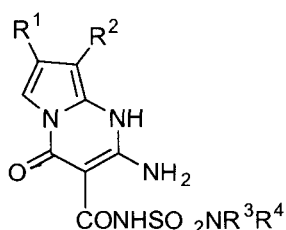




Gives high quality magenta images with good access time.

392

- Pyrrolo [1,2-a]-Pyrimidine compound



Provides high density purple to cyan images with improved weatherability, storage, stability and fixability

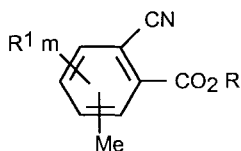
393

- Radiation - sensitive compn. containing quinonediazide compound for resist

Quinonediazosulfonate having substituent-XR (X = NH SO₂, CONH SO₂, NH CONH SO₂, NH SO₂ NH CO; R = alkyl, substd. alkyl, aryl, substd. aryl)

394

- Cyanobenzoic acid esters



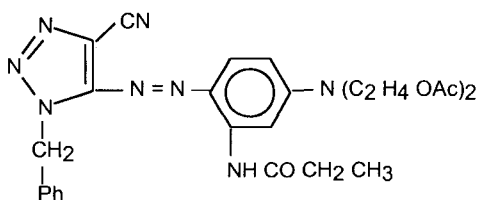
Example compound:

(R = Me, R¹ = Cl, m = 4); (Yield: 80%)

Useful as isoindolinone pigment intermediate.

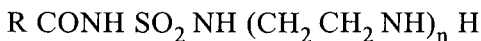
395

- Disperse triazole azodyes



Useful for dyeing hydrophobic, high molecular weight polyester fabrics in brilliant yellow shades with good fastness. **396**

- High molecular weight aliphatic sulfonamides of alkylene polyamides, and polyalkylene polyamines



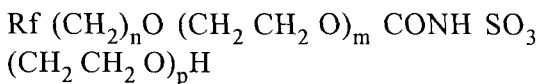
R = polymeric residue, viz., polyisobutylene.

Component of ashless lubricating oil **397**

- CSI is reacted with a diamine (Dimethylamino propylamine), and Vistalon 4608 (EPDM rubber)

Used as lubricating oil dispersant. **398**

- Fluorinated urethane N - Sulfonic acid esters.



Rf = C₆H₁₀ perfluoroalkyl; n = 1-2;

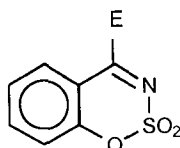
m = 0 - 4; p = 4 - 50

As heat sensitive emulsifier in textile finishing and polymerization. **399**

- Chlorinated sulphur Compounds containing nitrogen (like CSI)

Intermediate in the manufacture of textile assistants, pesticides and pharmaceutical agents. **400**

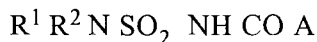
- Sulfonimines



As a bleach catalyst for detergent in clearing of fabric (soiled, for example, with tea stains) or hard surfaces.

401

- Chlorosulfonyl deriv. as anaerobic accelerators.

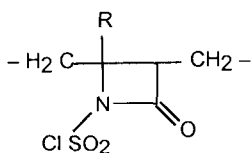


(A = OR³, OOR³, NR¹ R²; R¹ = H, org. groups, R² R³ = org. groups)

As catalyst for the curing of anaerobic acrylic compositions.

402

- Modified Isoprene and butadiene homo- and copolymers



R = Me for polyisoprene
= H for polybutadiene.

As polymers with better heat resistance and vulcanizates with higher modulus and lower breaking elongations.

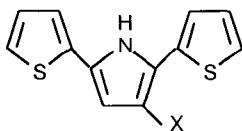
403

- Hydrophilic Polyacetylene films

The films are endowed with good electric conductivity and mechanical properties.

404

- 2, 5- Dithienyl pyrrole monomers



Semi-conducting oligomers.

405

X = CHO; O₂N.CH = CH; MeO₂CCH = CH; MeO₂SCH₂CH(OH); HO₂C(CH₂)₂CO, MeO₂C(CH₂)₂CO. etc.)

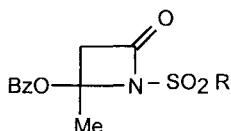
- Stable dispersions of polymers in polyfunctional compounds having a plurality of active hydrogens

β-Methoxy - acryloyloxyethyl
(chlorosulfonyl) carbamate + styrene +

(AIBN) $\xrightarrow{\Delta}$ styrene copolymer

dispersion

- β-Acyloxycrotonic acid amide N-sulfonahalides



(R = Cl, F)

- CSI modified polymer, based on styrene-isoprene (film)

Useful in the manufacture of polyurethane foams.

406

Used as an intermediate for sweeteners.

407

Used as desalination membrane.

408

- Sizing of paper with mixtures of an anionic sizing agent and a cationic stabilizer.

Octadecanol + Octadecylamine $\xrightarrow{\text{CSI}}$

Me (CH₂)₁₇CO₂NH SO₂NH (CH₂)₁₇Me (I)

[(I) + polyethylenimine] = sizing agent & stabilizer

Used as a sizing agent for paper.

409

Author Index (Part I)

Arabic numerals indicate reaction numbers.

- Abe, N., 449
Abdaoui, M., 259, 264
Abramski, W., 299
Abt, C.D., 317, 326, 349
Adams, S.P., 14
Adam, W., 272
Adiwidjaja, G., 313, 314
Adolphi, H., 30
Agoh, B., 261, 263, 266, 290
Aida, T., 170
Alarcon, B., 277
Albrecht, E., 464
Alender, J., 260
Ali, F.E., 500
Allen, (Jr.), G.R., 4, 89
Allan, R.D., 380
Amato, J.S., 424, 425, 429, 431, 434
Ammon, H.L., 181
Anderson, H.J., 440, 442
Andreson, M., 289
Angelov, Kh., 194
Anguiar, L., 278
Aouf, N., 254, 255, 257, 259
Appel, R., 404, 412, 499, 500, 507, 518
Archelas, A., 157
Arnason, T., 517
Arnsward, M., 533, 534
Arvanaghi, M., 279
Ashe, B.M., 106, 107
Askani, R., 159
Atkinson, J.G., 350, 435
Aue, D.H., 35, 135, 136
Babad, E., 262
Babin, N.A., 328
Badawey, E-S. A.M., 465
Bag, A.K., 318, 319, 341, 418, 481
Baker, W.R., 352
Baldwin, J.E., 215, 216
Ball, R.G., 24
Balzarini, J., 309
Balzer, H., 148
Barbachyn, M.R., 399
Barends, R.J.P., 165
Barker, P.L., 107
Barnet, G.H., 440
Barret, A.G.M., 38, 171, 288
Bartisch, H., 97

- Barton, T.J., 29, 56, 69, 113, 134, 135, 228, 333, 520, 523
- Bateson, J.H., 105, 140
- Battistini, C., 271
- Batzer, H., 148
- Baum, J., 512
- Baxter, A.J.G., 139, 140, 168, 400
- Begley, M.J., 13
- Behrend, E., 405, 411
- Bellver, C., 432
- Belsky, K.A., 262
- Belzecki, C., 299
- Bennett, G.B., 395
- Bentel, P., 30
- Berezina, V.F., 328
- Bergan, T. 269
- Berge, J.M., 67, 156
- Berger, H., 408
- Berges, II, D.A., 150
- Bernardinelli, G., 286, 406, 409, 413
- Bernath, G., 120
- Bernstein, P.R., 371
- Bertian, H., 31
- Bestian, H., 53, 191
- Betts, M.J., 38, 288
- Beutel, P., 365
- Bhadbhade, M.M., 125, 166, 167
- Bhushan, V., 272
- Biener, H., 53, 175, 296, 489
- Black, D.S.C., 22
- Black, H.T., 317, 326, 349
- Blaschette, A., 503
- Boettcher, A., 460
- Borchardt, J.K., 202, 203, 207
- Borrer, A.L., 4, 444
- Boscacci, A.B., 22
- Botteghi, C., 365, 367
- Bousley, R.F., 289
- Bovy, P.R., 14
- Boyle, R.W., 441
- Brackeen, M.F., 438
- Brault, J.F., 292, 295
- Braun, J., 512
- Brause, K.A., 106
- Brems, P., 464
- Broadhurst, M.J., 4, 48, 89, 187, 188, 215, 217, 220, 222, 223, 229, 231, 232, 233, 234
- Brown, D.W., 440, 494
- Brown, F., 371
- Brownell, J., 530
- Brunn, E., 87
- Brunsvold, W.R., 221
- Bryan, D.B., 215, 216
- Bryuzgin, A.A., 280
- Buckle, D.R., 300, 495
- Bulbenitschek, P., 503
- Burden, P.M., 380
- Burgess, E.M., 252
- Buss, W., 519
- Butler, B., 24
- Buynak, J.D., 196, 198, 199, 200
- Calas, R., 16
- Calligaris, M., 525
- Calvo-Flores, F.A.G., 437

- Camarasa, M.-J., 309
 Camp, N.P., 177
 Campbell, M.M., 397
 Campion, J.G., 14
 Camus, P., 401
 Capmau, M.L., 278
 Capraro, H.G., 385
 Carey, F.A., 114
 Carlsen, P., 269
 Carrasco, L., 277
 Celamerck, G.m.b.H., 414
 Chan, G.W., 150
 Chan, W.W.S., 24
 Chandler, G.O., 106
 Chandrasekaran, R.Y., 196, 200
 Chang, S.C., 354
 Chelucci, G., 365, 367
 Chen, A.F-T., 32, 202, 208, 428
 Cheng, K., 24
 Chernega, A.N., 482
 Cherng, Y-J, 152
 Chichetkin, V.I., 328
 Chinoporos, E., 4, 444
 Chmielewski, M., 19, 57, 84, 204, 299
 Christensen, B.G., 274
 Christl, M. 87
 Chu, S.C., 196, 200
 Ciganek, E., 49
 Ciurdaru, G., 202, 208
 Clardy, J., 113, 215, 229
 Clark, J.D., 352
 Clauss, K., 23, 28, 53, 108, 135, 137, 146,
 315, 322, 323, 327, 329, 331, 332,
 334, 360, 361, 377
 Cohen, E., 422
 Colvin, E.W., 15, 17, 59, 101, 197
 Conway, T.T., 46
 Cooper, R.D.G., 173
 Cossio, F., 126, 193
 Coustal, S., 51
 Coutinho, F.B., 68
 Crabbè, P., 145
 Crawford, W.C., 91, 123, 180, 183
 Criton, M., 256, 257
 Crombie, L., 10, 13
 Cronk, L.A., 371
 Crowley, J., 121
 Cutler, A., 70, 243
 Dahlgren, M.E., 107
 Davlluhn, J., 503
 Damas, C.E., 151, 376
 Danesi, R., 270
 Daniel, J., 307, 320, 339, 452, 459, 472
 Datmund, D., 424
 Datta, C.P., 490
 Datta, S.K., 512
 Deak, G., 396
 Debaerdemaeker, T., 460, 478
 De Clereq, E., 309
 De Las Heras, F.G., 277
 Delaunay, B., 263, 290
 Deleris, G., 16, 99
 Dellea, P.S., 106
 De Meester, P., 196, 200
 De Meijere, A., 132, 133

- De Oliveira, P.A.M., 72
 Deprès, J-P., 145
 De Sowsa Gomes, A., 71
 Destexhe, R., 470, 497
 De Villiers, O.G., 20, 81, 308
 Dewynter, G., 254, 255, 256, 257, 259, 263, 264, 266, 267, 290
 Dhar, D.N., 47, 76, 119, 122, 124, 125, 166, 167, 176, 179, 283, 305, 307, 318, 319, 320, 335, 339, 340, 341, 342, 343, 344, 356, 366, 418, 445, 450, 452, 458, 459, 463, 471, 472, 473, 474, 475, 476, 477, 481, 492, 496, 498
 Diaz, M.P., 432
 Dickinson, K.H., 139, 168
 Diehr, H.J., 142
 Dietrich, A., 282
 Dilda, P., 256
 Diwan, P.V., 293
 Doherty, J.B., 106
 Dolphin, D., 441
 Dorn (Jr.), C.P., 106
 Dortmund, D., 424, 425, 429, 431, 439
 Dosset, D.L., 371
 Doyle, T.W., 46
 Drach, B.S., 328
 Drew, M.G.B., 82
 Drogovoz, G.K., 328
 Du Bois, G.E., 250
 Duboudin, J.G., 253
 Dugat, D., 170
 Duncan, J.A., 251
 Dunkelblum, E., 36, 71, 134
 Dunogues, T., 16
 Durham, P.J., 273
 Durkheimer, W., 436
 Durst, T., 170
 Eates, G.W., 416
 Effenberger, F., 9, 235, 301
 Eguchi, S., 42, 44, 45, 88, 116
 Ehntholt, D., 70, 243
 Eisenhauer, G., 500
 Ejmocki, Z., 420
 Ellenberger, S.R., 21, 141
 Elloumi, N., 278
 Erden, I., 132, 133, 221, 227, 306
 Ertas, M., 379, 430
 Esch, P.M., 521
 Esipenko, A.A., 482
 Espie, J.C., 25
 Evanics, F., 120
 Fahey, J.L., 274
 Fang, J.M., 152, 153
 Fauble, H., 398
 Favre, G., 259
 Feigen, L.P., 14
 Feldman, P.L., 438
 Felix, A.S., 277
 Felzenstein, A., 39
 Fenwick, A., 38, 288
 Ferber, P.H., 225, 226
 Fetyukhim, V.N., 482
 Fiandor, J., 277
 Figuiredo, A.M., 72

- Filosa, M.P., 4, 444
 Finke, P.E., 106
 Firestone, R.A., 107, 274
 Fischer, M.H., 24
 Fischli, A., 357
 Fish, R.W., 70, 243
 Fitzpatrick, L.J., 265
 Fletcher, B.S., 106
 Fliri, A., 77
 Floyd, A.J., 440, 494
 Foster, A., 440, 442
 Foucoud, A., 393
 Foyos, J., 229
 Franceschi, G., 271
 Franck, R.W., 240
 Frappier, F., 51
 Frelak, J., 204
 Friedrich, H.J., 52, 315, 322, 323, 327, 329,
 331, 332, 334, 360, 361
 Friedrichsen, W., 460, 478
 Fuchs, R., 272
 Fukumoto, K., 60, 61
 Fulöp, F., 117, 120
 Furman, B., 19, 57, 84, 204
 Furst, G.T., 116
- Galemmo (Jr,) R.A., 273
 Ganschow, S., 310, 368, 374
 Garcia, M.V., 484
 Garcia - Lopez, M.T., 277
 Garcia - Luna, A., 390, 479
 Gareth, M., 104
 Garland, R.B., 14
 Gautun, H., 269
- Garner, A.W., 260
 Gehanne, S., 18
 George, C., 198
 Gervasi, G., 270
 Gerwalt, Z., 480
 Giammaruco, M., 18
 Gibbard, A.C., 230
 Giering, W.P., 70, 243
 Giger, R., 417
 Gimenez, M., 437
 Ginsburg, D., 417
 Girard, Y., 350, 435
 Gleason, J.G., 500
 Gleiter, R., 9, 301
 Glemser, D., 487
 Goebel, P., 137, 146
 Gomes, A.S., 68, 72
 Gompper, R., 201, 202, 205
 Goodgame, D.M.L., 78
 Gouriou, Y., 393
 Graboski, G.G., 170
 Graf, R., 1, 2, 23, 33, 72, 98, 126, 131,
 248, 281, 284, 297, 298, 311, 315,
 323, 363, 365, 391, 433, 435, 489,
 493, 531
 Grandberg, I.I., 462
 Grant, E., 250
 Gream, G.E., 225, 226
 Greene, A.E., 145
 Grimm, D., 108, 377
 Groder, J., 299
 Gronowitz, S., 515
 Groutas, W.C., 258
 Gunther, D., 6, 50, 73, 391

- Haas, A., 405, 411
 Hachiken, H., 455
 Hagmann, W.K., 106
 Hahn, H., 528
 Haigh, D., 10
 Hajri, A., 256
 Halchak, T., 181
 Hale, J.J., 106
 Haley, E., 196, 198, 200
 Hall, C.R., 526
 Hall, R.H., 20, 81, 308, 358
 Hammer, H., 447
 Harcus, R.G., 397
 Hard, K.M., 106
 Harnden, M.R., 513
 Harrison, A.M., 93
 Harsen, J.F., 172
 Harvey, D.M., 177
 Hassner, A., 138, 143, 149, 195, 275, 285,
 324, 325, 327
 Haug, T., 148
 Hauser, F.M., 21, 141, 155
 Hayakawa, K., 5, 94, 184
 Hayase, Y., 387, 388, 389
 Hebbel, K.C., 371
 Hedayatullah, M., 287, 292, 295
 Heider, L., 301
 Helga, R., 480
 Hendricks, R.T., 251
 Hendrickson, J.B., 374
 Herchen, S.R., 4, 444
 Herczeg, L.J., 262
 Hetenyi, A., 117
 Heydt, A., 488
 Heyn, H., 53
 Hiemstra, H., 521
 Hill, S.P.W., 78
 Hirai, K., 62, 63, 64, 246
 Hirako, Y., 45
 Hirama, M., 65
 Hodges, M.L., 260
 Hoechst, A.-G., 330, 421
 Hofman, J., 110
 Hoffmann, H., 142
 Hoft, E., 310, 368, 374
 Hogeveen, H., 41, 160
 Hohenlohe-Oehringen, K., 77
 Holland, H.J., 82
 Hollywood, F., 109
 Holman, R., 289
 Homelehle, K.L., 289
 Honda, T., 60, 61
 Houge-Frydrych, C.S.V., 300, 495
 Houk, K, N., 221
 Hsiao, C.N., 8
 Hu, Y.R., 525
 Hugentobler, 362
 Hughton, E., 512
 Hugueny, J.C., 287
 Huisman, H.O., 165
 Hulen, C., 278
 Hull, R., 109, 466, 467, 490
 Hummel, C.F., 209, 210, 213, 214, 224
 Hurst, D.T., 513
 Iberbia, P.A., 206

- Iio, H., 85, 302
 Ikeba, M., 455
 Imajo, S., 66
 Imanieh, H., 34, 104
 Imanishi, T., 118
 Imbach, J.L., 261, 263, 266, 290
 Imbert, J-P., 504
 Isaacs, N.S., 31
 Ishiguro, M., 66
 Ito, S., 65
 Ito, Y., 85
 Iwahashi, H., 35, 135, 136
 Iwahashi, M., 35
 Iwakawa, T., 386, 387, 388, 389
 Iwata, C., 118
 Iwata, H., 66
 Jacobus, J.O., 260
 Jaffe, I., 374
 Jalandoni, C.C., 182
 Jandralla, H., 79
 Jannitti, N., 270
 Jansing, J., 240
 Janssen, E., 527
 Jasat, A., 441
 Jensen, H., 315, 322, 323, 327, 329, 331, 332, 334, 360, 361, 391
 Jones, C.F., 13
 Jones, R.C.F., 10
 Jones, P.G., 503
 Jordaan, A., 20, 80, 81, 308, 358
 Joseph, S.P., 283, 335, 458, 473, 474
 Jouany, M., 51
 Julian, T.N., 289
 Kaannich, H.J., 519
 Kakehi, A., 449
 Kakihana, T., 172
 Kalita, E.V., 328
 Kaluza Z., 19, 57, 84, 204, 299
 Kamal, A., 293, 318, 336, 337, 381, 382, 384, 427, 446, 485
 Kametani, T., 60, 61
 Kampe, K.D., 238
 Kanda, Y., 96
 Kaneko, T., 276
 Kappe, T., 465
 Karady, S., 424, 425, 429, 431, 434, 439
 Karnaratne, V., 441
 Katz, T.J., 92
 Kaufmann, D., 133, 227
 Kelly, J.F., 3, 26, 102, 128, 130, 190, 191, 210, 240
 Kemp, J.E.G., 66, 156
 Keshava Murthy, K.S., 149, 305, 335, 366, 450, 498
 Kiehs, K., 30
 Kim, K-H., 352
 Kim, M-H., 453
 King, L.W., 14
 Kingsbury, W.D., 150
 Kinsman, R.G., 440, 494
 Kinzig, C.M., 150
 Kirchgaessner, U., 272
 Kirkbride, P.K., 225, 226
 Kirschner, S., 219
 Kishi, Y., 276
 Kishida, Y., 62, 63, 64, 246
 Kissinger, A.L., 106

- Kitazume, T., 321
 Kiuchi, K., 96
 Klarberg, B., 422
 Klein, C.L., 249
 Klenk, H., 235
 Klot, I.M., 294, 378
 Knight, W.B., 106
 Ko, T-Y., 152
 Kobayashi, T., 321
 Kobayashi, Y., 85
 Kobelt, D., 238
 Kobrich, G., 245
 Kohenlohe-oehringen, K., 76
 Kohn, H., 364, 419
 Konkell, M.J., 161
 Kousch, E., 504
 Kraemer, A.D., 351
 Kramarenko, F.G., 482
 Krause, B.R., 289
 Krebs, B., 486
 Krell, R.D., 500
 Krolikiewicz, K., 13, 37, 75, 365, 369, 443, 510, 516
 Krow, G.R., 228
 Kuang, R., 258
 Kuehleln. K., 316
 Kumadaki, S., 96
 Kumar, P.R., 158, 348
 Kwok, K.L., 262
 Kwong, K.S., 251

 L'Abbe., G., 464, 470, 491, 497
 Lach, D., 201, 202, 205

 Lachheim, S., 408
 Langbeheim, M., 39, 40
 Lanzendörfer, F., 87
 Lattrell, R., 86, 291, 403, 415
 Latscha, P., 338
 Lau, C.J., 4
 Laumen, K., 79
 Lanzendorfer, F., 87
 Laziri, N., 278
 Lecea, B., 126, 193
 Lee, C., 215
 Lee, C.H., 215, 364, 419
 Legault, R., 170
 Leitch, L.C., 517
 Levkovskaya, G.G., 280
 Levy, S.V., 229
 Lewis, T., 82
 Leydet, A., 261, 266
 Lhomme, J., 401
 Lhomme, M.F., 401
 Lilyefors, S., 515
 Lincoln, R., 78
 Lindmark, R.J., 14
 Loader, C.E., 440, 442
 Loewe, W., 353, 355
 Lohaus, G., 268, 285, 287, 291, 365, 370, 403, 407, 415
 Lohse, F., 148
 Lorincz, T., 306
 Lourens, G.J., 20, 80, 81, 358
 Lysket, R., 204

 Macchia, M., 270

- MacEachern, A., 517
 Maciejewicz, N.S., 274
 MacLeod, D., 34, 104
 Maduskuie, (Jr.) J.P., 371
 Mahkham, M., 505
 Maiti, S.N., 461
 Malpass, J.R., 42, 43, 115, 116, 162, 163, 164, 211, 219
 Manabe, T., 5, 94, 184
 Mann, J., 82, 83
 Mansukhani, R., 395
 Mar, K.E., 441
 Marchetti, M., 365, 367
 Marquet, A., 51
 Martin, P., 385
 Martinek, T., 117
 Maruthamuthu, P., 531
 Mason, R.B., 395
 Mathe, S., 373
 Mathew, J., 198
 Matsuda, H., 62, 63, 64, 246, 449
 Matterstock, K., 98, 391, 531
 Matzanke, N., 353
 Matzin, Ab R., 10
 Maycock, A.L., 106
 Mayer, H., 357
 Mazzocchi, P.H., 74, 90, 93, 181
 McCague, R., 236
 McMackins, D.E., 14
 Mehta, G., 47, 119, 122, 124, 125, 166, 167, 176, 179, 340, 445
 Menendez-Castrillon, P.P., 277
 Menendez, J.C., 432, 457, 484
 Mengel, R., 410
 Merkel, D., 245
 Metzanke, N., 353, 355
 Metzger, K., 148
 Mews, R., 486, 487, 502, 506, 508
 Meyers, A.I., 127
 Meyer, W.C., 139, 144
 Mickel, S.J., 8
 Micotich, R.G., 461
 Midenberger, H., 407
 Milanese, A., 448
 Miller, M.J., 8
 Minh, D.T., 253
 Mirskova, A.N., 280
 Miyandera, T., 242
 Miyano, M., 14
 Miyano, T., 242
 Mochizuki, T., 60
 Moeckel, G., 478
 Möller, M., 313
 Mondeshka, D., 194
 Monteith, M., 15, 58, 101, 198
 Montenash, M., 404, 412, 501, 507, 518
 Montero, J.L., 254, 255, 256, 257, 258, 259, 261, 263, 264, 266, 267, 290
 Moody, C.J., 230, 236, 303, 454
 Morand, P., 517
 Moreau, B., 278
 Morere, A., 259
 Moriconi, E.J., 3, 26, 74, 90, 91, 102, 116, 123, 128, 130, 139, 144, 180, 182, 183, 190, 191, 192, 209, 210, 213, 214, 224, 237, 239, 240, 241, 247, 347, 365
 Morin, C., 157

- Mosebach, R., 528
 Mosher, N.W., 416
 Mostowicz, D., 299
 Muller, G.W., 250
 Mumford, R.A., 106
 Mundloss, E., 311
 Murabayashi, A., 386, 387, 389
 Muschweek, R., 436
 Muthu, S., 532
- Nageswar, Y.V.D., 394
 Nagurnaya, N. A., 328
 Nakagawa, S., 242
 Nakata, T., 276
 Nakatsuka, T., 66
 Nakayama, A., 60, 61
 Nam, N.L., 462
 Narasimhan, K., 158
 Nardin, G., 525
 Narender, A.V., 446
 Naser-ud-din, 469
 Nativi, C., 54, 57, 100, 178
 Natsumi, M., 96
 Neergaard, J.R., 114
 Neidlein, R., 351, 528
 Nelson, K.H., 397
 Nethercleft, M., 513
 Neumann, W.P., 533, 534
 Nicholson, N.S., 14
 Nicolaou, K.C., 92
 Niess, R., 301
 Nishida, S., 5, 94, 184
 Nagurnaya, N.A., 329
- Oberhaensli, W., 357
 Ochal, Z., 420
 Ohra, T., 118
 Olah, G.A., 279, 390, 479
 Olson, J.T., 317, 326, 349
 Onan, K.D., 4, 444
 Osborne, S., 13
 Otto, E., 436
 Overton, H. J., 83
 Ozmeral, C., 260
- Paddon-Row, M.L., 221
 Page, P.C.B., 55, 103, 244
 Pajouhesh, H., 505
 Panzerknoodle, S.G., 14
 Paquette, L.A., 4, 48, 69, 89, 95, 172, 185,
 186, 187, 188, 202, 208, 215, 217,
 218, 219, 220, 222, 223, 228, 229,
 231, 232, 233, 234
 Parameswarn, K.N., 294, 378, 383
 Parashikov, V., 194
 Parson, P.J., 177
 Pasto, D.J., 32, 154, 202, 203, 207, 208,
 428
 Patchatt, A.A., 424, 425, 429, 431, 439
 Patel, G.S., 274
 Paulus, E.F., 238
 Peng, Z., 524
 Penton, (Jr.) H.R., 252
 Peréz-Peréz, M.-J., 309
 Perrone, E., 271
 Perrotta, E., 54, 58, 100, 178
 Peter, D., 104
 Petersen, C.P., 4, 444

- Peterson, E.M., 530
 Pfaendler, H.R., 7, 11, 169
 Philips, J.C., 172
 Picard, J.A., 289
 Pieron, J., 116
 Pilidis, G., 212
 Pillot, J.P., 99
 Pindur, U., 453
 Pinto, I.L., 300, 495
 Pirenhenkov, V.V., 482
 Pisano, J.M., 107
 Pissono, J.M., 24
 Ponsford, P.J., 400
 Potts, K.T., 512
 Poutsma, M.L., 206
 Pramod Kumar, 345
 Prendergast, K., 24
 Priputina, L.S., 328
 Proehl, H.H., 503
 Prossel, G., 108, 377

 Quayle, P., 34, 104
 Quinn, A.M., 105
 Quiros, M., 78

 Raduechel, B, 189
 Raghu, S., 70, 243
 Raghunathan, R., 463, 471, 475, 476, 496
 Rahim, A., 513
 Rainer, R., 426
 Ramasseul, R., 25
 Rao, A.B., 288, 293
 Rao, K.R., 336, 337, 346, 394, 456, 483

 Rao, M.N., 196, 198, 199, 200
 Rao, M.V., 293
 Rashid-baigi, Z.A., 289
 Rasmussen, J.K., 275, 285, 324, 325, 327
 Rassat, A., 25, 373
 Ray (Jr.), W.J., 249
 Rayez, J.C., 99
 Raymond, D.H., 13
 Reamer, R.A., 424, 425, 429, 431, 434, 439
 Reddy, A.V.N., 461, 485
 Rees, C.W., 230, 236
 Regainia, Z., 255, 267
 Regitz, M., 402, 488
 Reich, K., 511
 Reynolds, G.A., 354
 Rhee, R.P., 141, 155
 Ricci, A., 54, 58, 100, 178
 Rico, J.G., 14
 Rida, S.M., 465
 Riddell, F.G., 120
 Riegl, I., 469
 Riemenschneider, W., 6
 Rihs, G., 385
 Rittersbacher, H., 499
 Rivero, R.A., 265
 Roa, G., 126, 193
 Roberson, C., 174, 522
 Roberts, P.M., 140, 168
 Roberts, S.M., 67, 156
 Robles - Diaz, R., 437
 Rodakowski, K., 420
 Roehr, A., 314
 Roesky, H.W., 392, 404, 527

- Rogers, R.D., 4
 Rogido, R.J., 29, 56, 69, 113, 134, 135, 333, 520, 523
 Rokach, J., 350, 435
 Romming, C., 312
 Rosenblum, M., 70, 243
 Rosenthal, S., 55, 103, 244
 Roshan, A.Y., 440, 494
 Rubenstein, R., 417
 Rudolf, S., 7
 Ruetjes, T., 353, 355
 Ruppert, I., 507

 Sabat, M., 171
 Salomone, R.A., 3, 26, 102, 130, 240
 Salyers, A.K., 14
 Samarai, L.I., 482
 Sampath Kumar, E., 343, 344, 492
 Sano, H., 359
 Santoyo, G.F., 437
 Sarel, S., 39, 40
 Sasakai, Y., 60
 Sasaki, T., 5, 42, 44, 45, 88, 94, 116, 184
 Sato, T., 386
 Sattur, R.B., 293, 318, 336, 337, 346, 381, 382, 394
 Sauvage, M., 278
 Scarafile, C., 271
 Schaumann, E., 313, 314, 504
 Schlegel, G., 408
 Schmidt, E., 316
 Schoen, W.R., 24
 Schossler, W., 402

 Schretzman, L., 14
 Schultz, T.H., 221
 Schwarz, O., 97
 Scott, L.T., 221
 Selvi, T.K., 348
 Sergeev, S.A., 328
 Shah, S.K., 106
 Shapiro, H.S., 371
 Shaviv, A., 71
 Sheers, E.H., 284
 Shellhamer, D.F., 35, 135, 136
 Shi, G.Y., 294, 378, 383
 Shigemoto, T., 65
 Shimakawa, Y., 237, 240, 241, 247
 Shukla, D., 307
 Siegfried, B., 362
 Simpson, W.R.J., 395
 Singh, I.P., 461
 Singh, R., 173
 Siriwardene, U., 198
 Skatteboel, L., 312, 469
 Skuballa, W., 189
 Sliskovic, D.R., 289
 Smale, T.C., 105, 140, 168, 400
 Smets, G., 491
 Smith, D.G., 300, 495
 Smith, D.J.H., 526
 Smith, R.G., 24
 Smolders, C.A., 111, 112
 Smorada, R.L., 154
 Snader, K.M., 500
 Snarl, S., 39, 40
 Snipes, E.R., 150

- Soldan, F., 6, 50, 73
 Soliman, F.S., G., 465
 Sollhuber, M.M., 432, 457, 484
 Soucy-Breau, C., 517
 Southgate, P.M., 400
 Southgate, R., 105, 140, 168
 Speckamp, W.C., 521
 Speckamp, W.N., 165
 Sridhara, N.S., 338
 Srinivasan, T.N., 346, 394, 456, 483
 Sroka, P., 372
 Stacey, A.D., 513
 Stanfield, R.L., 289
 Steinbeisser, H., 487
 Stephens, R.L., 352
 Stern, C.A., 4, 444
 Stevens, E.D., 249
 Strasser, R., 11, 169
 Strochschein, R.J., 395
 Sugai, S., 359
 Sugihara, Y., 449
 Sundermeyer, W., 519
 Suri, S.C., 47, 119, 122, 124, 125, 166,
 167, 176, 179, 340, 342
 Suschitzky, H., 66, 109, 156, 466, 467,
 468, 490
 Suwinska, K., 204
 Suzuki, K., 242
 Swann, E., 303, 454
 Sza Konyi, Z., 117, 120
 Szilagyi, S., 260
 Tabak, D., 71
 Taddei, M., 18, 54, 58, 100, 178
 Taite, B.B., 14
 Takemoto, Y., 118
 Tamura, H., 387, 388, 389
 Tanaka, R., 66
 Tanaka, T., 12
 Tanino, H., 276
 Tann, C.H., 262
 Taylor, E.A., 252
 Taylor, S.J., 171
 Terashima, S., 85
 Tesky, F.M., 486, 502, 506, 508
 Thiem, K.W., 245
 Thyagarajan, G., 381
 Tiekink, E.R.T., 226
 Timberlake, J.W., 249, 260, 423
 Tjoeng, F.S., 14
 Tokoroyama, T., 302
 Toth, M.V., 14
 Toupet, L., 264
 Tripathi, M., 356, 477
 Truestdell, D., 229
 Tsai, D.J.S., 262
 Tull, R.J., 424, 425, 429, 431, 439
 Tuominen, T.C., 399
 Turini, B.L., 154
 Tutkunkardes, S., 404
 Tweedle, N.J., 42, 43, 147, 162, 163, 164
 Udupa, M.R., 486
 Ueda, Y., 151, 376
 Ugalde, J.M., 126, 193
 Ulivi, P., 18
 Ulmschneider, D., 6

- Ulrich, H., 31
Underwood, D.J., 106
Underwood, J.M., 177
Urbanczyk-Lipkowska, Z., 204
Urbanski, R., 299
Ushijima, R., 242
- Vacek, E.P., 371
Vachta, J., 362
Valter, K., 362
Van Allan, J.A., 354
Van der Does, L., 110
Van der Sarel, J.M., 491
Van der Velden, P.M., 111, 112
Vankar, Y.D., 279, 366, 390, 479, 498
Van Vtteren, T.E.C., 110
Vargas Bereguel, A., 437
Venkataraman, R., 258
Venkataraman, S., 304
Venkatesan, K., 125, 166, 167
Vhlenhaut, H., 518
Villacampa, M., 457, 484
Vince, R., 161, 530
Vinet, V., 151, 376
Vioglio, S., 271
Volz, W.E., 69, 95, 185, 186, 218
Vorbrüggen, H., 13, 27, 37, 75, 189, 365, 369, 443, 510, 516
- Walker, D., 262
Walrond, E.R., 466, 467, 468, 490
- Wamhoff, H., 379, 430
Wampfler, D.J., 154
Wang, M.H., 152
Wang, Y.K., 152
Wang, Y.W., 152, 153
Warm, A., 286, 406, 409, 413
Waschman, M.A., 116, 121
Weber, B., 488
Weber, W., 132, 133
Webster, R.A.B., 13
Wegener, P., 6
Weinstock, L.M., 425, 426, 429, 431, 434, 439
Weng, W.D., 152
Weston, H., 106
Wheeler, C., 180, 183
White, J.G., 116, 121, 240
Wiegard, N., 138, 143, 195
Willims, D.J., 78
Williams, K., 14
Williams, R.V., 55, 103, 244
William, W.M., 252
Winterfeldt, E., 447
Wipf, P., 304
Wittmann, H., 365, 372, 375
Woerpel, K., 174, 522, 524
Wojcicki, A., 129, 243, 525
Wrobel, J., 282
Wyvratt (Jr.), M.J., 24
- Xiao, Z., 423

- Yagi, S., 455
Yamada, H., 42, 44, 88, 116
Yamamoto, T., 321
Yamamoto, Y., 129, 243
Yamazaki, T., 321
Yamazaki, Y., 65
Yang, C-C, 153
Yarmenko, V.V., 328
Yasuyoshi, M., 455
Yee, Y.K., 371
Yonetoku, Y., 118
Yovell, J., 39
- Zablocki, J.A., 14
Zakonyi, Z., 120
Zamankhan, H., 392
Zara-Kaczian, E., 396
Zenfuku, K., 302
Ziegler, E., 365, 372, 375
Zupec, M.E., 14
Zwart, L., 41, 160

This page is intentionally left blank

Author Index (Part II)

Arabic numerals indicate reference numbers.

- Abdaoui, M., 118
Abe, T., 38
Acbi, J., 218
Acker, R.D., 26
Adams C.D., 224
Adams (Jr.), J.B., 47
Adams, S.P., 144
Addor, R.W., 97
Adolph, H., 380
Aebi, J., 218, 370
Aguilar, L., 256
Aihara, K., 310, 377
Ajioka, H., 209
Akiyama, S., 3, 15, 20, 37, 77
Alarcon, B., 108, 114, 222, 223, 383
Albarella, J.P., 405
Albrecht, H.A., 267, 378
Alessi, T.R., 192
Ali, F.E., 148, 149, 151
Amano, K., 377
Amedeo, F., 349
Anderson, D.J., 397
Anderson, M.K., 216, 252
Anderson, P.S., 257
Andersson, B.R., 203
Aoki, M., 213
Aouf, N., 118
Arabori, H., 17, 29
Arahira, M., 17, 29
Arai, T., 261
Araki, K., 16
Arneklev, D.R., 81
Asaad, F.M., 98
Asari, T., 176
Ashe, B.M., 255
Ashwood, M.S., 137
Atsumi, K., 310, 377
Audiav, F., 232
Auel, T., 91
Bacque, E., 249
Bailey, D.M., 115
Bailey, E.J., 221
Baker, C., 387
Baldacci, M., 153
(Baldischa Anilin & Soda) Fabrik A-G., 87
Ball, R.G., 230
Balsamo, A., 153
Balzarini, J., 123
Bantjes, A., 171, 175
Bar-Illan, A., 198
Barash, L., 362

- Barbachyn, M.R., 348
 Barnes, K.D., 96, 102
 Bashiardes, G., 249
 Bauer, K., 5, 52, 53, 54, 55, 57, 58, 82
 Baxter, A.J.G., 247
 Beaument, K., 8, 9
 Bedeschi, A., 356
 Beeby, P.T., 325
 Beecham group Ltd., 290
 Behrend, B., 88
 Bell, R., 221
 Bellon, S., 244
 Bellver, C., 162
 Bemis, G., 244
 Berger, H., 6
 Berger, J., 236
 Bernstein, P.R., 239
 Berredjem, M. 384
 Berthold, R., 207, 208
 Beugeling, T., 171
 Beutel, P., 380
 Bianchi, A., 219
 Bickel, H., 358
 Bieringer, H., 5, 52, 53, 54, 55, 57, 58, 82
 Biller, S.A., 379
 Bishop, B.C., 137
 Bochis, R.J., 225, 227
 Boehner, B., 39, 41, 43
 Bollinger, J.M., 398
 Borrod, G., 27
 Boufford, F.A., 306
 Bouhaddioui, N., 211, 212
 Bousley, R.F., 216, 252
 Bovy, P.R., 189
 Brackeen, M.F., 129
 Bradshaw, J., 328
 Brady, T.E., 78
 Braeunlich, G., 143, 146
 Brause, K.A., 255
 Brauynes, C.A., 359
 Brecht, H., 399
 Breuer, H., 270, 271, 274, 278
 Briggs, B., 143
 Bristol-Meyers Co., 354
 Brown, D.G., 97
 Brown, F.J., 239
 Brown, M.F., 136
 Brownell, J., 122
 Budzinski, J.C., 28, 65
 Buerstell, H., 52, 55, 57, 58, 82
 Burkholder, T.P., 233
 Buitler, B., 230
 Buynak, J.D., 281
 Cain, P.A., 92
 Cama, L.D., 302, 306, 307, 345, 361
 Camaggi, G., 106
 Camarasa, M.J., 108, 109, 123, 223, 383
 Camarasa, Rius, M.J., 385
 Campbell, H.F., 238
 Capmau, M.L., 256
 Cardozo, M.G., 124
 Carlsson, P.A.E., 203
 Carrasco, L., 114, 222, 223
 Carter, D.A., 112
 Carter, D.S., 236

- Cartwright, D., 45, 46
 Caster, K.C., 198
 Castro, A.C., 144
 Cecchi, R., 315
 Chan, W-S., 230
 Chandler, G.O., 255
 Chandrasekaran, R. Y., 281
 Chandy, T., 172, 181
 Chang, M.H., 360
 Chavernac, G., 234
 Chen, M-Q., 382
 Chene, A., 27
 Cheng, K., 230
 Chin, K., 145
 Chiyomaru, I. 104
 Cho, K., 145
 Cho, Y.S., 360
 Choi, K.I., 360
 Christensen, B.G., 286, 287, 288, 292,
 295, 296, 297, 299, 301, 302, 306,
 307, 308, 314, 316 317, 318, 319,
 320, 321, 324, 330, 345, 352, 361,
 362, 363, 364, 365
 Chrystal, E.J.T., 8, 9
 Chu, L., 226
 Chu, S.C., 281
 Chung, B.Y., 360
 Ciba- Geigy, A- G., 329, 409
 Clark, R., 261
 Clauss, K., 407
 Clayton, J.C., 210
 Cochran, J., 244
 Collonges, F., 234
 Conception, A., 143
 Condon, M.E., 1, 2, 78
 Connor, D.T., 140
 Conroy, C.W., 198
 Consonni, P., 298, 309, 315
 Cook, M.C., 328
 Cooper, K., 126, 251
 Cooper, R.D.G., 289
 Council of Scientific & Industrial Research,
 131
 Court, J.J., 166, 168
 Cozzi, P., 219, 374, 375
 Crassous, G., 173, 177, 179, 180
 Crawford, T.C., 126, 132
 Crespy, S., 211, 212
 Crip, H.A., 210, 338
 Criton, M., 110
 Crowley, P.J., 101, 107
 Cuervo, J-H., 144
 Cullison, D.A., 155
 Danesi, R., 153, 154
 Darke, P.L., 257
 D. Clercq, E., 123
 De Carneri, I., 219, 374, 375
 De Crescenzo, G.A., 248
 Deguchi, T., 100
 Dehmlow, H., 218, 370
 De Las Heras, F.G., 108, 109, 113, 114,
 222, 223, 383
 Delorme, D., 138
 Del Tacca, M., 153
 De Meester, P., 281
 Denzel, T., 278

- Depaoli, A., 309, 315
 Dereu, N., 249
 Desai, R.C., 166, 168, 169
 Devies, P., 117
 Devita, R.J., 62, 225, 227
 Dewynter, G., 118
 Dhiraj, L., 401
 Diaz, M.P., 162
 Diehl, R.E., 96, 97, 102
 Dickinson, K.H., 247
 Dilda, P., 110
 Diwan, P.V., 135, 190
 Djahoudi, A., 384
 Dodgson, S.P., 165
 Dodson, S.A., 238
 Doherty, J.B., 117, 167
 Dollinger, M., 14, 19, 33, 34, 67, 75
 Dolphin, B., 260
 Dorn (Jr.) C.P., 167, 255
 Doscher, M.E., 90
 Drabb (Jr.), T.W., 50, 76
 Drewes, M-W., 19, 33, 34
 Driedger, P.E., 121
 Drossard, J.M., 274
 Duccio, C., 349
 Duerckheimer, W., 240
 Duerr, D., 56, 64
 Duewel, D., 220
 Durham, P.J., 238
 Dyke, H.J., 264

 Eidenschink, R., 388
 Ejmocki, Z., 93

 Elebring, S-T., 203
 El- Harfi, A., 211, 212
 Ellingboe, J.W., 192
 Elliot, L.G., 210
 Elloumi, N., 256
 Emini, E.A., 257
 Ennis, M.D., 203
 Erdelen, C., 89
 Ermann, P.H., 274
 Ertel, H., 372
 Es - Sayed, M., 143, 146
 Eue, L., 85
 Eussen, J.H.H., 68
 Euverman, B.J., 175
 Evans, D.A., 379
 Eyvrat, M.J., 201

 Faarup, P., 214
 Fancher, L.E., 95
 Fancher, L.W., 44
 Farge, D., 331, 332, 334
 Favara, D., 298, 309, 315
 Favre, G., 118
 Fechtig, B., 333, 358
 Feldman, P.L., 129
 Felix, A.S., 114
 Fernandez - Resa, P., 108, 109, 111, 222,
 223, 383, 385
 Fiandor, J., 113, 114
 Filippin, L.A., 236
 Filippini, L., 106
 Findiensen, K., 14, 19, 21
 Finke, P.E., 117, 167, 255

- Finn, K., 281
 Firestone, R.A., 378, 330
 Fischer, M.H., 62, 226, 227, 229, 230
 Fischer, R., 143, 146
 Fisk, T.E., 406
 Fitzgerald, M., 143
 Fkushima, H., 337
 Flynn, D.L., 140
 Foery, W., 39
 Franceschi G., 356
 Frey, M., 53
 Froyd, J.M., 99
 Fugmann, B., 143, 146
 Fujita, S., 392
 Fujiwara, K., 209
 Fukami, T., 263
 Fukuroda, N., 196, 263
 Funaki, T., 120
 Furlenmeier, A., 277
 Furumine, M., 16
 Fusar, D., 219

 Gabrielsen, B., 112
 Galemmo (Jr.), R.A., 238
 Galullo, V., 244
 Gancedo, A.G., 113
 Gandolfi, C., 356
 Garavaglia, C., 106
 Garcia, L., 385
 Garcia - Lopez, M.T., 108, 109, 111, 113,
 114, 222, 223, 383
 Gardocki, J.F., 165
 Garland, R.B., 189

 Gass, K., 39
 Gebelein, C - G., 183, 185
 Georgiev, V.S., 163
 Gerard, M.P., 221
 Gervasi, G., 154
 Gesing, E., 12, 89
 Gesing, E.R.F., 14, 19, 33, 34
 Getman, D.P., 248
 Ghatlia, N., 401
 Gil - Fernandez, C., 113
 Girard, Y., 138
 Glaser, D.M., 402
 Gleason, J.G., 150, 152
 Go, A., 16
 Go, E., 145
 Godfrey (Jr.) J.D., 273
 Goi, M., 127, 128, 337
 Gomez De Las, H.F., 111, 385
 Gough, S.T.D., 27
 Granina, T.E., 59
 Greengrass, C.W., 340
 Gregory, G.I., 328
 Groutas, W.C., 147, 253
 Guare, J.P., 257
 Guerrier, D., 234
 Gusmeroli, M., 106
 Guthikonda, R.K., 265, 286, 287, 295, 302

 Ha, Y-J., 360
 Haadsma, S.R., 203
 Haas, A., 88
 Hachisu, M., 199
 Haeflinger, W., 157, 160

- Haenssler, G., 85
Hagen, H., 79
Hagiwara, D., 231
Hagmann, W.K., 167, 255, 265
Hajri, A., 110
Hale, J.J., 255
Hall, L.S., 92
Hamada, T., 10, 11, 13, 31, 32, 66, 74
Haman, R., 252
Hamelehle, K.L., 216
Hammond, C.E., 144
Hamprecht, G., 26
Hanai, R., 30
Haneishi, T., 170
Hanessian, S., 83, 105
Hanna, J., 362, 363
Harada, N., 202
Harada, T., 176, 392
Haramura, M., 170
Hargrave, K., 124
Harjanto, F., 179, 180, 186
Harrington, P.M., 1, 2
Harris, A.E., 201
Harutoshi, Y., 24
Hasegawa, M., 127, 128
Hashiguchi, S., 282
Hattori, K., 300
Hayama, T., 200
Hayashi, F., 145
Hayashi, K., 235
Hayashi, S., 100
Hayashi, Y., 176
Hayashibara, T., 351
Heaney, S.P., 101, 107
Heiba, E.A., 27
Hemelehle, K.L., 216, 252
Hemmerling, W., 386
Henmi, K., 188
Henning, R., 143, 146
Hermann, R.A., 97
Hermann, R., 373
Heubach, G., 372
Hideaki, N., 74
Hikido, M., 16
Hill, D.T., 152
Hill, J.M., 369
Himber, J., 218, 370
Hinks, J.D., 371
Hirai, H., 125
Hishamichi, H., 213
Hittich, R., 388
Hlasta, D.J., 166
Hockley, M.H., 262
Hoffman, D., 399
Hofheinz, W., 277, 279, 280
Hoople, D.W.T., 340
Hori, T., 120
Hosni, H., 98
Houghton, P.G., 137
Howarth, T.T., 340
Hubschwerlen, C.N., 277, 279, 280
Huggins, J.W., 112
Hulen, C., 256
Humes, J.L., 117
Humphrey, G.R., 137
Hungerbuhler, E., 303

- Hunt, E., 323, 371
 Hutchinson, A.J., 194
 Hutchinson, J.H., 138
 Huth, A., 156, 158, 159
- Ichinose, I., 29
 Iguchi, Y., 174
 Illian, G., 386
 Imanishi, Y., 174
 Inaba, T., 139, 250
 Inamoto, Y., 344
 Inoue, S., 199
 Inove, H., 357
 Irie, T., 311
 Isenring, H.P., 277, 279, 280
 Ishida, Y., 35
 Ishiguro, M., 357
 Ishihara, E., 104
 Ishii, M., 310
 Ishikawa, K., 3, 15, 20, 77, 200
 Iso, Y., 311
 Ito, Y., 10, 11, 13, 32, 66, 74, 76, 174, 312, 376
 Itoh, S., 35
 Iwaki, T., 311
 Iwamatsu, K., 310, 326, 379
 Iwata, M., 213
 Iwazawa, Z., 263
- Jacobine, A.F., 402
 Jakobsen, P., 214
 Jannitti, N., 154
 Jansen, J.R., 12, 33, 34, 89
 Jaziri, N., 256
- Jensen, H., 407
 Ji, Y-H., 218, 370
 Jimonet, P., 232
 Jinbo, Y., 393
 Johannes, K., 359
 Johnston, D.B.R., 288, 292, 296, 306, 319, 330
 Jonsen, J.R., 19
 Joseph, G., 184
 Jozefowicz, M., 173, 177, 179
 Julian, T.N., 252
- Kadin, S.B., 130, 133, 142
 Kajitani, M., 209
 Kamal, A., 135
 Kamatu, Y., 336
 Kamei, K., 196
 Kamhi, V.M., 96, 103
 Kamiyama, N., 275, 285
 Kampe, K.D., 372
 Kan, K., 276, 285, 304, 350
 Kanano, K., 199
 Kanase, K., 94
 Kanda, Y., 17, 29, 235
 Kandou, Y., 35
 Kaneko, T., 261
 Kano, J., 377
 Kano, Y., 310
 Kanstrup, A., 214
 Kapadia, S.R., 124
 Kariya, A., 94
 Kashima, S., 199
 Katada, J., 176

- Katano, K., 326
Katano, T., 326
Kato, H., 16
Katritzky, A.R., 198
Katsu, K., 336
Kawabata, K., 343, 344
Kawahara, T., 261
Kayakiri, H., 237
Kazunari, O., 24
Kefauver, D.F., 112
Kehne, H., 4, 5, 54, 55, 57, 58
Kehr, W., 156
Keith, D.D., 267, 378
Kelly, T.A., 124
Kempen, H.J.M., 175
Kern, J.A., 345
Khare, R., 86
Kiehs, K., 380
Kii, M., 311
Kim, K.S., 266, 272, 381
Kinoshita, K., 269
Kirk, B.E., 221
Kirsch, R., 220
Kirsi, J.J., 112
Kirsten, R., 19, 89
Kishida, Y., 125
Kishimoto, S., 282
Kissinger, A.L., 255
Kityama, I., 120
Klotz, M., 187
Kluft, C., 175
Kluth, J., 14, 19, 21
Kobayashi, Y., 312, 376
Kochler, G., 404
Kocsis, K., 333, 358
Koenig, K., 14, 19, 21
Koga, M., 390
Koh, H.Y., 360
Kondo, M., 282
Konig, K., 12
Kondo, S., 326
Konzelman, F.M., 267, 378
Kostlan, C.R., 140
Krause, B.R., 216, 252
Krause, J., 388
Krauth, C.A., 112
Krell, R.D., 148
Kuang, R., 253
Kubota, H., 213
Kudlacz, E.M., 233
Kudo, T., 379
Kuhla, D.E., 238
Kukel, C.F., 97
Kuroda, A., 237
Kuroda, N., 38
Kurumaru, K., 170
Kusuoka, Y., 10, 11, 13, 31, 32, 66, 74
Kuznetsova, G.V., 18, 59
Kwiatkowski, P.L., 92
Kwong, C.D., 112
Lachhein, S., 4, 6
Landes, A., 79
Lardy, C., 234
Latha, A., 172, 181
Latif, N., 98

- Lawson, K.R., 107
Leanza, W.J., 314, 362, 363, 364, 365
Lee, G.H., 27
Lee, W-C., 144
Lengsfeld, H., 218, 370
Le Roy, P., 331, 332, 334
Lester, M.G., 221
Leudke, E.S., 117
Levitt, G., 25, 28, 65, 70, 71
Liao, Y-S., 144
Lin, C.H., 200
Lin, K.C., 144
Lin, N.H., 405
Linker, K-H., 14, 21
Litieu-Binh, 233
Littman, B.H., 126, 251
Liu, Y., 382
Lo, Y.S., 164, 197
Loeher, H.J., 53
Loewe, H., 220
Loi, N.P., 59
Lombardi, P., 355, 356
Lombardo, L.J., 141
Longo, A., 356
Lopes, A., 92
Lotz, T.J., 395
Lowen, G.T., 97
Luerssen, K., 7
Lyle, T.A., 257

Maccha, B., 153
Macchia, M., 153, 154
Maccoss, M., 117, 167

Maerki, H-P., 218, 370
Magerlein, B., 266
Maggiori, S., 375
Makino, K., 3, 10, 11, 13, 15, 29, 32, 37, 66, 74, 77
Makino, S., 139
Manath, T.P., 112
Marc, P.A., 78
Maren, T.H., 198
Marfat, A., 134, 136
Maria, T., 223, 385
Marteau, J., 403
Martel, A., 284, 353
Maryanoff, B.E., 165
Matassa, V.G., 239
Matsuda, H., 125
Matsuda, K., 327
Matsumoto, S., 269, 275, 285
Matsuo, M., 231, 282
Matsushita, T., 393
Matzinger, P., 396
Maynard, G.D., 233
Mcdonald, I., 245
McNeil, D.W., 124
Melikhova, I.N., 59
Menard M., 284, 353
Menchetti, P., 219, 374
Mendez, C., 385
Mendez, J.C., 162
Mendez- Castrillon, P.P., 108, 109, 113, 114, 223, 383
Mendjel, H., 178, 179, 180, 182, 186, 211, 212
Merck and Co, Inc., 293, 294, 366, 367,

- 368
Metysova, J., 161
Meyer, F., 186
Meyer, G., 179, 180
Meyer, W., 39
Mignani, S., 232
Mikolajczyk, J., 335
Mildenberger, H., 82
Mitsui Toatsu Chemicals Inc. 42
Miwa, A., 195
Miyahara, M., 120
Miyai, K., 343, 344
Miyake, N., 231
Miyama, A., 268, 269, 275, 285, 304, 350
Miyano, M., 189
Miyano, T., 202, 205, 206
Miyazaki, H., 176
Miyazaki, M., 30
Miyokan, I., 120
Mizukoshi, T., 31
Moerker, T., 258, 259
Montana, J., 264
Montero, J.L., 110, 118, 384
Moody, C.J., 254
Morand, O., 218, 370
Moreau, B., 256
Moren-Lech, I., 335
Morere, A., 118
Morimoto, K., 37
Mormile, S., 106
Motokawa, K., 311
Moutonnier, C., 331, 332, 334
Mrozik, H., 226, 229
Mueller, K-H., 14, 19, 21, 89
Mueller, R.A., 248, 273
Muller, K-H., 12, 33
Mulligan, M.D., 140
Mumford, R.A., 117
Muramoto, K., 261
Murata, M., 300, 337
Murphy, D., 183, 185
Muschaweck, R., 240
Myake, A., 342, 346, 347
Myama, A., 347
Naarmann, H., 404
Nagai, T., 120
Nagaki, H., 139
Nagase, H., 393
Nagaoka, T., 3, 10, 11, 13, 15, 20, 32, 66, 77
Nagashima, N., 269
Nageswar, Y.V.D., 190
Nagura, J., 196, 263
Nakabayashi, A., 326
Nakagawa, S., 205
Nakahira, K., 32
Nakajimi, T., 300
Nakamura, A., 351
Nakamura, T., 336
Nakao, M., 342, 346
Nakao, T., 195
Nakatsuka, T., 357
Nami, K.K., 357
Nanjo, K., 94
Narukawa, Y., 313

- Nasu, T., 357
 Nawamaki, T., 3, 10, 11, 13, 15, 20, 32, 37, 666, 74, 77
 Negi, S., 336
 Nemecek, C., 249
 Neumann, P., 157, 160
 Newton, T.W., 22, 36
 Nielsch, U., 146
 Nigorikawa, K., 393
 Niki, T., 3, 10, 11, 13, 15, 20, 31, 32, 66, 74, 77
 Nilz, G., 79
 Nishikibe, M., 196, 200
 Nishimura, T., 341
 Nishitani, Y., 311
 Nolan, J.C., 197
 Nomura, K., 393
 Nortey, S.O., 165

 O' Brien, P.M., 216
 Ochal, Z., 93
 Ochi, S., 199
 Ochiai, M., 282
 Ogino, H., 326
 Ogiwara, S., 351
 Ohashi, T., 268, 269, 275, 276, 285, 304, 350
 Ohi, N., 261
 Ohkuro, M., 261
 Ohno, T., 209
 Ohta, K., 35
 Ohtani, M., 127, 128
 Okazaki, T., 176
 Oku, T., 237

 Olesen, H.P., 214
 Omodei-Sale, A., 298, 309, 315, 349
 Onodera, A., 337
 Onodira, N., 94
 Onoue, H., 305, 313
 Oohashi, T., 347
 Oosowa, T., 195
 Ootsu, S., 30
 Orsetti, A., 211, 212
 Oszczapowicz, I., 335
 Ott, H., 207, 208
 Otto, F., 240
 Oughton, J.F., 338
 Outcalt, R.J., 92
 Oyama, Y.I.S., 357
 Ozaki, F., 261

 Pae, A.N., 360
 Paleirac, G., 178, 182, 211, 212
 Palenschat, D., 156
 Paloma, P., 385
 Parameswaran, K.N. 187
 Paschelke, G., 156
 Patchet, A.A., 201
 Patel, U.R., 124
 Pautrat, R., 403
 Pazoles, C.J., 126, 251
 Perez, C., 113
 Perez-Perez, M.J. 123
 Perez, S., 113
 Peter, H., 258, 259
 Petersen, W.C., 63
 Peterson, E.M., 122

- Peyronel, J.F., 331, 332, 334
 Pham, P.T., 116
 Phillipp, V., 89
 Picard, J.A., 216, 217, 241, 242, 243, 246, 252
 Pietro, C.R., 349
 Pietsch, H., 407
 Pisano, J.M., 228, 230
 Pobert, P.M., 247
 Pojouhesh, H., 281
 Prendergast, K., 230
 Procopiou, P.A., 221
 Protiva, M., 161
 Proudfoot, J.R., 124
 Prozd, V.N., 59

 Quick, J., 121

 Rao, A.B., 135, 190
 Rao, K.R., 190
 Rao, M.N., 281
 Rao, M.V., 135
 Rashidbaigi, Z.A., 252
 Ratcliffe, R.W., 286, 287, 295, 314
 Reap, J.J., 23
 Rebek (Jr.), J., 369
 Regainia, Z., 384
 Rempfler, H., 51, 56, 61, 64
 Ren, T., 72
 Rico, J.G., 189
 Riebel, H-J., 7, 14, 19, 21, 33, 34, 67, 75
 Robert, R., 85
 Robinson, R.P., 134

 Rodakowski, K., 93
 Roemer, M., 388
 Roesner, M., 220
 Rogers, N.H., 322, 323
 Romero, A-G., 203
 Rorer, M.P., 60
 Rraf, R., 400
 Rueger, R., 391
 Ruggeri, S.G., 126
 Rusakova, N.I., 59
 Rye, M., 145

 Sada, I., 268, 276, 304, 347, 350
 Sadohara, H., 30
 Saito, S., 127, 128
 Saitoh, Y., 237
 Sakaguchi, S., 394
 Sakai, J., 100
 Sakane, K., 343, 344
 Salituro, F., 244
 San, F.G.A., 111
 Sanceau, J-Y., 83, 105
 San Felix Garcia, A., 385
 San Felix, A., 222
 Santel, H-J., 7, 14, 21, 33, 34, 67, 75, 85
 Sarges, R., 191, 192
 Sasaki, T., 310
 Sasho, M., 336
 Sato, K., 394
 Sato, T., 17, 29, 37
 Satoh, S., 237
 Satoh, Y., 176
 Satsudo, K., 300

- Sattur, P.B., 135, 190
Sauer, G., 158, 159
Sauers, R.F., 47
Sauvage, M., 256
Sawada, A., 188
Scartazzini, R., 333
Schallner, O., 19
Scher, H.B., 44, 95
Schering, A-G., 215
Schlegel, G., 4, 6
Schlief, W.A., 257
Schmid, G., 218, 283, 370
Schmidt, E., 407
Schmidt, R.R., 7, 21
Schmiechen, R., 156
Schmitt, S.M., 288, 292, 296, 319
Schneider, H.H., 158, 159
Schneider, P., 333
Schneider, S., 143
Schoen, W.R., 62, 225, 226, 227, 228, 229, 230
Schretzman, L., 189
Schue, F., 178, 179, 180, 182, 186, 211, 212, 404
Sederel, L.C., 171, 175
Sendai, M., 282
Sendo, Y., 311
Setoi, H., 237
Setsu, F., 310
Sevensson, K.A.I., 203
Shah, S.K., 117, 167, 255
Shamblee, D.A., 197
Shank, R.P., 165
Shapovalov, A.A., 59
Sharma, C.P., 172, 181, 184
Shell Internationale Research
Maatschappij, B.V., 103
Shi, G.Y., 187
Shih, D.H., 297, 299, 301, 308, 314, 316, 317, 318, 320, 352
Shih, D.H-M., 362, 36
Shih, T.L., 229
Shimazaki, N., 188
Shimazaki, Y., 127, 128
Shimizu, S., 29
Shimotori, T., 139
Shimoyama, Y., 199
Shimiziu, S., 29, 204
Shiokawa, S., 310
Shiraishi, H., 38
Shirakawa, K., 394
Shrum, G.P., 140
Shue, Y-K., 369
Sidebottom, P.J., 221
Signorini, E., 106
Sikora, A., 335
Singh, J., 144
Singh, H., 86
Singh, R., 289
Sinodis, D.N., 92
Sinojara, A., 199
Siokawa, M., 377
Sledz, J., 173, 177, 178, 179, 180, 182, 186, 211, 212
Sliskovic, D.R., 216, 241, 242, 243, 246, 252

- Smale, T.C., 291
 Smith, C., 221
 Smith, D.B., 99
 Smith, R.G., 230
 Snader, K.M., 148
 Sollhuber, M.M., 162
 Sonoda, J., 261
 Sorokin, V.I., 18, 59
 Sota, K., 337
 Southgate, R., 247
 Sperzel, M., 143, 146
 Sraub, H., 274
 Srivastava, M., 86
 Stamm, E., 51
 Stanfield, R.L., 216, 252
 Stenzel, K., 89
 Stetter, J.S., 85
 Stevenson, R., 322
 Stjernlof, N.P., 203
 Stork, B., 68
 Stuborn, G., 146
 Studt, W.L., 238
 Sturton, G., 143
 Sudo, K., 32, 66, 77
 Suga, K., 268, 269, 275, 347
 Sugiyama, I., 336
 Sun, E.T., 248
 Suzuki, H., 3, 10, 11, 13, 15, 20, 31, 32, 66, 77
 Suzuki, K., 3, 15, 20, 37, 202, 205, 206
 Suzuki, M., 127, 128
 Swann, E., 254
 Tabiie, N., 120
 Tachiki, A., 176
 Takano, S., 139
 Takaya, T., 343
 Takayama, K., 213
 Takehi, T., 30
 Takenaka, O., 261
 Takeno, R., 139
 Takita, K., 104
 Takizawa, H., 377
 Takle, A.K., 371
 Talley, J.J. 248
 Tamaru, M., 30
 Tamura, A., 310
 Tanaka, H., 237
 Tanaka, K., 139
 Tanaka, L., 390
 Tanaka, M., 327
 Tanaka, R., 357
 Tanaka, T., 250
 Tang, H., 260
 Taniguchi, Y., 199
 Tatsuo, N., 24
 Terajima, A., 312, 376
 Tetsunori, K., 393
 Theophilou, N., 404
 Therien, M., 138
 Thompson, W.J., 257
 Thummel, R.C., 51, 56
 Thus, J.L.G. 68
 Thyagrajan, G., 190
 Timmons, P.R., 92
 Timmons, S.F., 387
 Titman, R.B., 262
 Tjoeng, F.S., 189

- Tomimoto, M., 282
 Tozer, M., 245
 Toyooka, Y., 310
 Trane, F., 219, 374, 375
 Treuner, U.D., 271, 274, 278
 Tristram, E.W., 201
 Trueb, W., 40
 Tsuroka, T., 199, 326
 Tsushima, M., 377
 Tsushima, S., 341
 Tsutsumi, H., 300
 Tsutsumi, K., 250
 Tsybalova, L.A., 59
 Turnbull, J.P., 338
- Ubukawa, Y., 305
 Ueyama, N., 276, 304
 Umemura, E., 377
 Unangst, P.C., 140
 Unbanietz, J., 220
 Urushibata, I., 100
 Ushijima, R., 205
 Uwaydah, I.M., 164
- Valenta, V., 161
 Van Der, D., 359
 Van Der Does, L., 171, 175
 Van Duijl, J.F., 171
 Van Gemert, B., 48, 49, 69, 73
 Vazquez, M.L., 248
 Venkataraman, R., 253
 Vilas, P., 113
 Vince, R., 116, 122
- Vogt, B.R., 155
 Vors, J.P.A., 92
 Wachtel, H., 156, 158, 159
 Wafilm, B.V., 408
 Walsch, D.A., 164
 Welter, H., 79
 Watanabe, K., 268, 276, 304, 347, 350
 Watanabe, S., 3, 10, 11, 13, 15, 20, 37, 66, 77, 188
 Watanabe, Y., 337
 Watson, N.S., 221
 Weber, G., 388
 Weingarten, G.G., 339
 Weinhardt, K.K., 236
 Wellinga, K., 68
 Wierenga, W., 217
 Wijesekera, T., 260
 Wikstrom, H.V., 203
 Wildfeuer, M.E., 119
 Wildonger, K.J., 364
 William, K., 189, 265
 Willms, L., 4, 5, 52, 53, 54, 55, 57, 58, 80, 82
 Willner, K.D., 126, 251
 Wilson, E.M., 210
 Wilson, M.W., 140
 Winger, R., 386
 Wiscount, C.M., 257
 Woo, E-R., 360
 Wright (Jr.), D.P., 97
 Wright, M., 338
 Wuerzer, B., 26
 Wyvratt (Jr.), M.J., 62, 225, 227, 228, 229, 230

- Xie, L., 260
- Yamada, S., 209
- Yamaji, Y., 30
- Yamamori, T., 235
- Yamanaka, M., 336
- Yamauchi, H., 336
- Yammato, N., 209
- Yang, R-Y., 83, 105
- Yang, S-Y., 382
- Yano, M., 200
- Yano, S., 209
- Yasuo, I., 24
- Yokoo, C., 337
- Yonekura, N., 100
- Yoshida, C., 139
- Yoshida, S., 199
- Yoshikawa, H., 35, 128
- Yoshikawa, K., 127
- Yoshimura, T., 100
- Youle, D., 101, 107
- Yu, G., 369
- Yu, K.K., 239
- Zablocki, J.A., 189
- Zahler, R., 273
- Zhang, Z-Y., 382
- Ziegler, R., 157, 160
- Zimmerman, C.N., 144
- Zimmerman, D.F., 65, 84
- Zugay, J.A., 257
- Zukowski, E., 335
- Zupee, M.E., 189
- Zydowsky, T.M., 369

References

1. Condon, M.E., Harrington, P.M., Eur. Patent, EP 679,646; C.A. **124**, 117342^h(1996).
2. Condon, M.E., Harrington, P.M., Eur. Patent, EP 661,275; C.A. **123**, 286076^j (1995).
3. Makino, K., Akyama, S., Suzuki, H., Nagaoka, T., Niki, T., Suzuki, K., Nawamaki, T., Watanabe, S., Ishikawa, K., Japanese Patent, JP 05,310,709; C.A. **120**, 245,141^w(1994).
4. Willms, L., Lachhein, S., Schlegel, G., Kehne, H., Eur. Patent, EP 507,093; C.A. **118**, 22259^y(1993).
5. Willms, L., Kehne, H., Bauer, K., Bieringer, H., (Hoechst A.G.) Eur. Patent, 303,114; C.A. **111**, 57762^q (1989).
6. Schlegel, G., Lachhein, S., Berger, H., Eur. Patent, EP 501,369; C.A. **118**, 8613^C (1993).
7. Riebel, H.J., Santel, H.J., Luerssen, K., Schmidt, R.R., German Patent, DE 4,126,423; C.A. **119**, 8826^v (1993).
8. Chrystal, E.J.T., Beutement, K., Brit. U.K. Patent, GB 2,287,464; C.A. **124**, 79458^r (1996).
9. Chrystal, E.J.T., Beutement, K., (Zeneca Ltd.) Brit. U.K. Patent, GB 2,284,811; C.A. **124**, 56574^m (1996).
10. Makino, K., Suzuki, H., Nagaoka, T., Niki, T., Kusuoka, Y., Hamada, T., Nawamaki, T., Watanabe, S., Ito, Y., Japanese Patent, JP 07,330,765; C.A. **124**, 289581^b (1996).
11. Makino, K., Niki, T., Suzuki, H., Nagaoka, T., Kusuoka, Y., Hamada, T., Nawamaki, T., Watanabe, S., Ito, Y., PCT Int. Appl., WO 9532; C.A. **124**, 202297^s (1996).
12. Muller, K., Konig, K., Jansen, J., Gesing, E., Drewes, M., Dollinger, M., Wetcholowsky, I., (Bayer Aktiengesellschaft, Germany) PCT Int. Appl., WO 2,000,017,196; C.A. **132**, 237097, (2000).
13. Makino, K., Suzuki, H., Nagaoka, T., Niki, T., Hamada, T., Kusuoka, Y., Nawamaki, T., Watanabe, S., Ito, Y., Japanese Patent, JP 07,252,253; C.A. **124**, 146146^C (1996).
14. Findiesen, K., Linker, K-H., Gesing, E.R.F., Kluth, J., Mueller, K-H., Riebel, H-J, Koenig, K., Santel, H-J, Dollinger, M., Ger. Offen., DE 4,411,913; C.A. **124**, 87021^h (1996).

15. Mikino, K., Akyama, S., Suzuki, H., Nagaoka, T., Kiki, T., Suzuki, K., Nawamaki, T., Watanabe, S., Ishikawa, K., Japanese Patent, JP 07,196,654; C.A. **123**, 314013^g (1995).
16. Go, A., Araki, K., Kato, H., Hikido, M., Furumine, M., Japanese Patent, JP 06,329,642; C.A. **122**, 160676^r (1995).
17. Kanda, Y., Arabori, H., Arahira, M., Sato, T., Eur. Patent, EP 648,764; C.A. **122**, 314581^v (1995).
18. Sorokin, V.I., Kuznetsova, G.V., Can. Pat. Appl., CA 2,036,334; C.A. **118**, 169122^g (1993).
19. Muller, K-H., Drewes, M.W., Gesing, E.R.F., Jonsen, J.R., Kirsten, R., Kluth, J., Konig, K., Riebel, H-J., Schallner, O., Findensen, K., Dollinger, M., (Bayer A.G., Germany) PCT Int. Appl., WO 9,732,876, DE Appl., 19,609,059; C.A. **127**, 293227^v (1997).
20. Makino, K., Akiyama, S., Suzuki, H., Nagaoka, T., Niki, T., Sdzuki, K., Nawamaki, T., Watanabe, S., Ishikawa, K., PCT Int. Appl., WO 9,300,336; C.A. **120**, 134534^g (1994).
21. Findiesen, K., Linker, K.H., Kluth, J., Mueller, K.H., Riebel, H.J., Koenig, K., Santel, H.J., Schmidt, R.R., Ger. Offen., DE 4,234,801; C.A. **121**, 205350^c (1994).
22. Newton, T.W., (Shell International Maatschapij B.V.) Braz. Pedido, PI BR 9,205,136, DE Appl., 9,112,20; C.A. **121**, 280657^m (1994).
23. Reap, J.J., (du Pont de Nemours, E.I. and Co.) Brit. U.K. Pat. Appl., 2,015,503; US Appl., 882,918; C.A. **93**, 8202^h (1980).
24. Yasuo, I., Kazunari, O., Tatsuo, N., Harutoshi, Y., Eur. Pat. Appl., EP 238,070; C.A. **108**, 204632^r (1988).
25. Levitt, G., (du Pont de Nemours, E.I., and Co.) Eur. Pat. Appl., EP 45,196 US Appl., 172,997; C.A. **97**, 6325^j (1982).
26. Acker, R.D., Hamprecht, G., Wuerzer, B., (BASF A.G.) Ger. Offen., DE 3,128,527; C.A. **98**, 198284^k (1983).
27. Gough, S.T.D., Heiba, E.A., Lee, G.H., Borrod, G., Chene, A., (Rhone Poulenc Agrochimie) Belg., BE 893, 939, US Appl. 286,937; C.A. **98**, 215335^x (1983).
28. Budzinski, J.C., Levitt, G., (du Pont de Nemours, E.I. and Co.) US Appl., 144,856; C.A. **98**, 14346^k (1983).
29. Shimizu, S., Kanda, Y., Ichinose, I., Sato, T., Arahira, M., Arabori, H., (Kureha Chem. Industry Co.Ltd., Japan) Jpn. Kokai Tokkyo Koho, JP 10029990; C.A. **128**, 167447^z (1998).
30. Takehi, T., Miyazaki, M., Tamaru, M., Yamaji, Y., Hanai, R., Ootsu S., Sadohara, H. (Kumiai Chem. Industry Co. Ltd.; Ihara Chem. Co. Ltd.) PCT Int. Appl., WO 9,742,188; C.A. **128**, 3699 (1998).

31. Suzuki, H., Niki, T., Kusuoka, Y., Hamada, T., Mizukoshi, T., (Nissan Chem. Industries Ltd., Japan) Japan Kokai Tokkyo Koho, JP 09132574; C.A. **127**, 5104 (1997).
32. Suzuki, H., Niki, T., Kusuoka, Y., Hamada, T., Nagaoka, T., Makino, K., Nawamaki, T., Ito, Y., Sudo, K., Nakahira, K., (Nissan Chem Ind. Ltd. Japan) Japanese Patent JP 08,277,289; C.A. **126**, 74875 (1996).
33. Drewes, M-W., Gesing, E.R.F., Jansen, J.R., Muller, K-H., Riebel, H.-J., Dollinger, M., Santel, H.-J., (Bayer A.G., Germany) Ger. Offen., DE 95-19504281; C.A. **125**, 195684^f (1996).
34. Jansen, J.R., Drewes, M.W., Gesing, E.R.F., Riebel, H-J, Dollinger, M., Santel, H-J, (Bayer A.G., Germany) Ger. Offen., DE 4435470; C.A. **125**, 10843^r (1996).
35. Ohta, K., Itoh, S., Kandou, Y., Yoshikawa, H., Ishida, Y., *Nippon Nayaku Gakkaishi*, **19**, 137 (1994); C.A. **122**, 239623^c (1995).
36. Newton, T.W., (Shell Internationale Research Maatschappij B.V., Neth.) Eur. Pat. Appl., EP 549079; C.A. **120**, 298645^v (1994).
37. Makino, K., Sato, T., Morimoto, K., Akiyama, S., Suzuki, K., Nawamaki, T., Watanabe, S., (Nissan Chem. Ind. Japan) Japanese Patent, JP 01,213,286; C.A. **112**, 158227^v (1990).
38. Kuroda, N., Abe, T., Shiraishi, H., (Ube Industries Ltd., Japan) Japanese Patent, JP 62,033,159; C.A. **107**, 198349^q (1987).
39. Boehner, B., Foery, W., Gass, K., Mayer, W., (Ciba Geigy A.G.) Eur. Pat. Appl., EP 97,122; C.A. **101**, 23507^p (1984).
40. Trueb, W., (Sandoz Patent G.m.b.H) Ger. Offen., DE 3, 243,533; C.A. **99**, 105288^x (1983).
41. Boehner, B., (Ciba Geigy Corp.) U.S. Patent, US 4,391,976; C.A. **99**, 105293^v (1983).
42. (Mitsui Toatsu Chemicals), Inc. Jpn. Kokai, Tokkyo Koho, JP 5,815,962 [8315,962]; C.A. **99**, 53793^m (1983).
43. Boehner, B., (Ciba Geigy A.G.) Ger. Offen., DE 3,300,569; C.A. **99**, 139980^g (1983).
44. Fancher, L.W., Scher, H.B., (Stauffer Chemical Co.) U.S. Patent, US 4,357,351; C.A. **99**, 21964^b (1983).
45. Cartwright, D., (Imperial Chemical Industries PLC) Brit. UK Pat. Appl., GB 2,137,989; C.A. **102**, 131714^b (1985).
46. Cartwright, D., (Imperial Chemical Industries, PLC) Braz. Pedido, PI BR 8401, 598; C.A. **103**, 87655^j (1985).
47. Adams (Jr.), J.B., Sauers, R.E., (du Pont de Nemours, E.I. and Co.) U.S. Patent, US 4,581,059; C.A. **105**, 42837^v (1986).

48. Van Gemert, B., (PPG Industries, Inc.) U.S. Patent, US 4,592,776; C.A. **105**, 97505^f (1986).
49. Van Gemert, B., (PPG Industries, Inc.) U.S. Patent, US 4,622,065; C.A. **106**, 84657ⁿ (1987).
50. Drabb (Jr.) T.W., (American Cyanamid Company, USA) Eur. Pat. Appl., EP 747,365; C.A. **126**, 117986 (1997).
51. Rempfler, H., Stamm, E., Thummel, R.C., Eur. Patent, EP 264,348; C.A. **109**, 33864^g (1988).
52. Willms, L., Baur, K., Bieringer, H., Burstell, H., German Patent, DE 3,822,841; C.A. **112**, 216951^q (1990).
53. Loeher, H.J., Willms, L., Frey, M., Bauer, K., Bieringer, H., German Patent, DE 3,826,609; C.A. **113**, 78412^g (1990).
54. Willms, L., Kehne, H., Bauer, K., Bieringer, H., Ger. Offen., DE 3,725,939; C.A. **111**, 57751^k (1989).
55. Kehne, H., Willms, L., Bauer, K., Bieringer, H., Burstell, H., Eur. Patent, EP 342,569; C.A. **112**, 198427^s (1990).
56. Rempfler, H., Duerr, D., Thummel, R.C., Eur. Patent, EP 337,943; C.A. **112**, 139044^s (1990).
57. Kehne, H., Willms, L., Bauer, K., Bieringer, H., Buerstell, H., (Hoechst A.G.) Eur. Pat. Appl., EP 342,568, DE Appl., 3,816,703; C.A. **112**, 216967^z (1990).
58. Kehne, H., Willms, L., Bauer, K., Bieringer, H., Buerstell, H., Ger. Offen., DE 3,909,053; C.A. **114**, 102063ⁿ (1991).
59. Sorokin, V.I., Kunznetsova, G.V., Rusakova, N.I., Tsybalova, L.A., Melikhova, I.N., Granina, T.E., Prozd, V.N., Shapovalov, A.A., Loi, N.P., PCT Int. Appl., WO 9,113,880; C.A. **116**, 151797^e (1992).
60. Rorer, M.P., U.S. Patent US 4,699,647; C.A. **108**, 204638^x (1988).
61. Rempfler, H., (Ciba Geigy A.G., Switz.) Eur. Pat. Appl., EP 401,168; C.A. **114**, 207037^k (1991).
62. Fisher, M.H., Wyratt, M.J., Schoen, W.R., Devita, R.J., (Merck and Co. Inc. USA) PCT Int. Appl., WO 9,216,524; C.A. **118**, 169109^h (1993).
63. Petersen, W.C., (du Pont de Nemours, E.I. and Co., USA) U.S. Patent, US 4,683,000; C.A. **107**, 217644^a (1987).
64. Rempfler, H., Duerr, D., Eur. Patent, EP 337,944; C.A. **112**, 139043^r (1990).
65. Budzinski, J.C., Zimmerman, D.F., Levit, G., (du Pont de Nemours E.I. and Co.) Eur. Pat. Appl., EP 39,239; U.S. Appl., 144,856; C.A. **96**, 85595^e (1982).
66. Makino, K., Suzuki, H., Nagaoka, T., Niki, T., Kusuoka, Y., Hamada, T., Nawamaki, T., Watanabe, S., Ito, Y., Sudo, K., (Nissan Chem. Ind Ltd. Japan) PCT Int. Appl.,

- WO 9518806; C.A. **123**, 228210 ⁿ (1995).
67. Riebel, H-J, Santel, H-J, Dollinger, M., (Bayer A.G. Germany) Ger. Offen., DE 4302700; C.A. **121**, 157667 ⁿ (1994).
68. Eussen, J.H.H., Thus, J.L.G., Wellinga, K., Stork, B., *Neth. Pestic. Sci.*, **29**, 101-8, (1990); C.A. **113**, 128019^g (1990).
69. Van Gamert, B., (PPG Industries, Inc., USA) U.S. Patent, US 4,666,508; C.A. **107**, 96742 (1987).
70. Levitt, G., (du Pont de Nemours, E.I., and Co.) U.S. Patent, US 4,401,816; C.A. **100**, 6548 ^q (1984).
71. Levitt, G., (du Pont de Nemours, E.I., and Co.) U.S. Patent, US 4,391,627; C.A. **99**, 139969^k (1983).
72. Ren, T., (Inst. of Chemical Metallurgy, Academia Sinica, Peop. Rep. China) Chinese Patent, CN 1,277,195; C.A. **135**, 122516 (2000).
73. Van Gemert, B., (PPG Industries Inc.) U.S. Patent, US 4,559,081; C.A. **104**, 207314^s (1986).
74. Makino, K., Hideaki, N., Niki, T., Kusuoka, Y., Hamada, T., Nawamaki, T., Watanabe, S., Ito, Y., (Nissan Chemical Ind. Ltd.) Japanese Patent, JP 07,278,144; C.A. **124**, 176080 ^u (1996).
75. Riebel, H.J., Santel, H.J., Dollinger, M., (Bayer A.G.) Eur. Pat. Appl., EP 609,733; C.A. **121**, 179623 ^x (1994).
76. Drabb (Jr.), T.W., (American Cyanamid Company, USA) U.S. Patent, US 5,559,234, C.A. **125**, 247849 ^k (1996).
77. Makino, K., Akyama, S., Suzuki, H., Nagaoka, T., Niki, T., Nawamaki, T., Watanabe, S., Ito, Y., Ishikawa, K., Sudo, K., (Nissan Chem. Ind. Ltd. Japan) Japanese Patent, JP 07,316,152; C.A. **124**, 232441 ^b (1996).
78. Brady, T.E., Condon, M.E., Marc, P.A., (American Cyanamid Company, USA) U.S. Patent US 5,009,699; C.A. **115**, 201118 ^m (1991).
79. Hagen, H., Nilz, G., Walter, H., Landes, A., (BASF A.G) Gen. Offen., DE 4,039,733; C.A. **117**, 131193 ^x (1992).
80. Willms, L., (Hoechst A.G.) Ger. Offen., DE 3,330,603; C.A. **103**, 54094 ^x (1985).
81. Arneklev, D.R., (Stauffer Chemical Co.) U.S. Patent, US 4,021,229; C.A. **87**, 48918^d (1977).
82. Willms, L., Mildenerger, H., Bauer, K., Buerstell, H., Bieringer, H., (Hoechst A.G.) Ger. Offen., DE 3,324,802; C.A. **102**, 203987^z (1985).
83. Henession, S., Yang, R-Y, Sanceau, J-Y, *Can. J. Chem.*, **75**, 712 (1997).
84. Zimmerman, D.F., (du Pont de Nemours, E.I. and Co.) Eur. Pat. Appl., EP 70,698; C.A. **99**, 5650 ^r (1983).

85. Stetter, J.S., Robert, R., Santel, H.J., Haenssler, G., Eue, L., (Bayer A.G.) Ger. Offen., DE 3,413,490; C.A. **104**, 104427^b (1986).
86. Srivastava, M., Khare, R., Singh, H., *Boll. Chim. Farm.*, **138**, 511, (1999).
87. Baldische, A., Soda Fabrik, A.G., (Rolf Appel and Gerhard Eisenhour) German Patent, 1,159,410; C.A. **60**, 10263^b (1964).
88. Haas, A., Behrend, E., (Bayer A.G.) Ger. Offen., 2,153,795; C.A. **79**, 18152^s (1973).
89. Drewes, M., Gesing, E., Jansen, J., Kirsten, R., Mueller, K., Philipp, U., Riebel, H., Stenzel, K., Wachendorff-Neumann, U., Erdelen, C., (Bayer A.G., Germany) German Patent, DE 1,9707,580; C.A. **129**, 195752 (1998).
90. Doscher, M.E., (American Cyanamid Co.) S. African, ZA 9,010,354, US Appl., 455,685; C.A. **117**, 42758^t (1992).
91. Auel, T., (Knapsach A.G.) German Patent, 2,125,143; C.A. **78**, 43693^t (1973).
92. Timmons, P.R., Outcalt, R.J., Kwiatkowski, P.L., Lopes, A., Cain, P.A., Sinodis, D.N., Hall, L.S., Vors, J.P.A., (Rhone Poulenc Agrochimie, Fr.) Eur. Pat. Appl., EP 460,940; C.A. **116**, 214337^c (1992).
93. Ejmocki, Z., Ochal, Z., Rodakowski, K., *Przem. Chem.*, **72**, 449 (1993); C.A. **121**, 57471^a (1994).
94. Onodira, N., Nanjo, K., Kariya, A., Kanase, K., (Agro-Kanesho Co. Ltd.) Eur. Patent 355,709; C.A. **113**, 115066^v (1990).
95. Scher, H.B., Fancher, L.E., PCT Int. Appl., 8,002,024, US Appl., 21,368,19; C.A. **94**, 208579^u (1981).
96. Barnes, K.D., Kamhi, V.M., Diehl, R.E., (American Cyanamid Co., USA) Eur. Pat. Appl., EP 549,866; C.A. **119**, 225812^s (1993).
97. Brown, D.G., Diehl, R.E., Lowen, G.T., Wright (Jr.), D.P., Kukel, C.F., Herman, R.A., Addor, R.W., (American Cyanamid Co., USA) Eur. Pat. Appl., EP 332,263; C.A. **113**, 231205^p (1990).
98. Latif, N., Asaad F.M., Hosni, H., *Liebigs Ann. Chem.*, 495 (1987).
99. Froyd, J.M., Smith, D.B., (American Cyanamid Co.) Eur. Pat. Appl., EP 358,047; U.S. Appl., 241,648; C.A. **113**, 115076^y (1990).
100. Urushibata, I., Yoshimura, T., Deguchi, T., Tonekura, N., Sakai, J., Hayashi, S., (Kumiai Chemical Industry Co. Ltd.; Dhara Chemical Industry Co. Ltd.) PCT Int. Appl., WO 9,318,012; JP Appl., 92/80, 264; C.A. **120**, 134513^z (1994).
101. Crowley, P.J., Youle, D., Heaney, S.P., (Zeneca Ltd.) PCT Int. Appl., WO 9,403,061, GB Appl., 92/16,441; C.A. **120**, 263835^e (1994).
102. Barnes, K.D., Kamhi, V.M., Diehl, R.E., U.S. Patent, US 5,284,863; C.A. **120**,

- 270098^v (1994).
103. Maatschappij B.V., (Shell Internationale Research) Japanese Patent, JP 62,207,260; C.A. **108**, 112453^e (1988).
104. Chiyomaru, I., Ishihara, E., Takita, K., (Kamiai Chemical Industry Co.Ltd.) Japanese Patent, 7,594,129; C.A. **84**, 1223^w (1976).
105. Hanessian, S., Yang, R-Y., Sanceau, J-Y., *Can. J. Chem.*, **75**, 712 (1997).
106. Camaggi, G., Filippini, L., Gusmeroli, M., Mormile, S., Signorini, E., Garavaglia, C., (Isagro Ricerca S.r.l., Italy) Eur. Pat. Appl., EP 718,280; C.A. **125**, 168644^m (1996).
107. Crowley, P.J., Heaney, S.P., Lawson, K.P., Youle, D., (Zeneca Ltd., UK) PCT Int. Appl., WO 9,507,022; C.A. **123**, 77144^r (1995).
108. Camarasa, M.J., Fernandez-Resa, P., Garcia-Lopez, M.T., Gomez De Las Heras, F.G., Mandez-Castrillon, P.P., Alarcon, B., Carrasco, L., *J. Med. Chem.*, **28**, 40 (1985).
109. Camarasa, R.M.J., Fernandez-Resa, P., Garcia-Lopez, M.T., Gomez De Las Heras, F.G., Mandez-Castrillon, P.P., Span ES 551,864; C.A. **109**, 93538^p (1998).
110. Hajri, A., Dewynter, G., Criton, M., Dilda, P., Montero, J., *Heteroat. Chem.*, **12**, 1 (2001).
111. Fernandez - Resa, P., San, F.G.A., Garcia - Lopez, M.T., Gomez de Las, H.F., Span ES 551,865; C.A. **109**, 93539^q (1988).
112. Gabrielsen, B., Kirsi, J.J., Kwong, C.D., Carter, D.A., Krauth, C.A., Hanna, L.K., Huggins, J.W., Manath, T.P., Kefauver, D.F., et al., *Antiviral Chem. Chemother.*, **5**, 209 (1994).
113. Fiandor J. Garcia-lopez M.T., De Las Heras, F.G., Mandez-Castrillon, P.P. Gil-Fernandez, C., Perez, S., Vilas, P., Perez, C., Gancedo A.G., *Nucleosides Nucleotides*, **8**, 257 (1989).
114. Fiander, J., Garcia-Lopez, M.T., De Las Heras, F.G., Mendez-Castrillon, P.P., Felix, A.S., Alarcon, B., Carrasco, L., *Eur. J. Med. Chem.*, **22**, 59 (1987).
115. Bailey, D.M., (Sterling Drug Inc.) U.S. Patent, US 4,829,084; C.A. **111**, 120951^t (1989).
116. Vince.R., Pham, P.T., *Nucleosides Nucleotides*, **14**, 2051 (1995).
117. Devies P., Doherty, J.B., Finke, P.E., Humes, J.L., Leudke, E.S., Maccoss, M., Mumford, R.A., Shah, S.K., Brit, U.K. Patent Cl CO7 0205/08; C.A. **121**, 9147^c (1994).
118. Abdaoui, M., Dewynter, G., Aouf, N., Favre, G., Morere, A., Montero, J-L., *Biorganic Med. Chem.*, **4**, 1227 (1996).
119. Wildfeuer, M.E., (Elli Lilly and Co., USA), U.S. Patent, US 5,521,294; C.A. **125**, 115095^b (1996).

120. Nagai, T., Miyokan, I., Kityama, I., Funaki, T., Tabiie, N., Miyahara, M., Hori, T., (Toyama Chemical Co. Ltd., Japan) Japanese Patent, JP 63,101,391; C.A. **112**, 660^w (1990).
121. Driedger, P.E., Quick, J., (Procyen Pharmaceutical Inc. USA) U.S. Patent, US 5,643,948; C.A. **127**, 135 972^e (1997).
122. Peterson, E.M., Brownell, J., Vince, R., *J. Med. Chem.*, **35**, 3991 (1992).
123. Perez-Perez, M.J., Balzarini, J. D., Clercq, E., Camarasa, M., *J. Bioorg. Med. Chem.*, **1**, 279 (1993).
124. Hargrave, K., Kelly, T.A., Kapadia, S.R., Proudfoot, J.R., Mc Neil, D.W., Patel, U.R., Cardozo, M.G., PCT Int. Appl., WO 9,522,545; C.A. **124**, 55993^k (1996).
125. Kishida, Y., Matsuda, H., Hirai, H., (Sankyo Co. Ltd.) Japan Kokai, 7,229,334; C.A. **78**, 58101^k (1973).
126. Cooper, K., Crawford, T.C., Littman, B.H., Pazoles, C.J., Ruggeri, S.G., Willner, K.D., PCT Int. Appl., WO 9,416,694; C.A. **124**, 187320^m (1994).
127. Yoshikawa, K., Hasegawa, M., Suzuki, M., Shimazaki, Y., Ohtani, M., Saito, S., Goi, M., (Taisho Pharm.Co. Ltd., Japan) PCT Int. Appl., WO 9,747,600; C.A. **128**, 61428^d (1998).
128. Yoshikawa, K., Hasegawa, M., Suzuki, M., Shimazaki, Y., Ohtani, M., Saito, S., Goi, M., (Taisho Pharm. Co. Ltd. Japan) PCT Int. Appl., WO 9,746,520; C.A. **128**, 61353^a (1998).
129. Feldman, P.L., Bracreen, M.F., (Glaxo Inc., USA) Eur. Pat. Appl., EP 433,048; C.A. **115**, 183117^d (1991).
130. Kadin, S.B., (Pfizer Inc., USA) Eur. Pat. Appl., EP 208,510; C.A. **106**, 138254^z (1987).
131. Council of Scientific and Industrial Research (India), Eur. Pat. Appl., EP 90,510; C.A. **100**, 68011^t (1984).
132. Crawford, T.C., (Pfizer Inc.) Eur. Pat. Appl., EP 155,828; US Appl., 590,667; C.A. **104**, 109466^y (1986).
133. Kadin S.B., (Pfizer Inc.) Eur. Pat. Appl., EP 156,603; C.A. **104**, 109468^a (1986).
134. Robinson, R.P., Marfat, A., (Pfizer Inc. USA) Eur. Pat. Appl., EP 436,333; C.A. **115**, 207974^j (1991)
135. Rao, K.A., Diwan, M.V., Rao, A.B., Sattur, P.B., *Eur. J. Med. Chem*, **23**, 487 (1988).
136. Brown, M.F., Marfat, A., (Pfizer Inc. USA) PCT Int. Appl., WO 9,713,751; C.A. **126**, 34348^a (1997).
137. Ashwood, M.S., Bishop, B.C., Houghton, P.G., Humprey, G.R., Eur. Patent, EP

- 500,171; C.A. **118**, 6853^g (1993).
138. Girard, Y., Hutchinson, J.H., Therien, M., Delorme, D., (Merck Frosst Canada Inc.) PCT Int. Appl., WO 9,411,378; C.A. **123**, 143926^a (1995).
139. Takano, S., Yoshida, C., Inaba, T., Tanaka, K., Takeno, R., Nagaki, H., Shimotori, T., Makino, S., (Toyama Chemical Co. Ltd) Ger. Offen., DE 3,834,204, JP Appl., 87/254,251; C.A. **111**, 214389^t (1989).
140. Connor, D.T., Kostlan, C.R., Mullican, M.D., Wilson, M.W., Flynn, D.L., Shrum, G.P., Unangst, P.C., (Warner Lambert Co.) Eur. Pat. Appl., EP 371,438, U.S. Appl., 277,171; C.A. **113**, 231381^t (1990).
141. Lombardo, L.J., (American Home Products Corp.) Eur. Pat. Appl., EP 470,805, U.S. Appl., 564,263; C.A. **116**, 235266^u (1992).
142. Kadin, S.B., U.S. Patent, US 4,725,616; C.A. **110**, 23728^x (1989).
143. Braunlich, G., Es-Sayed, M., Fischer, R., Henning, R., Fugmann, B., Schneider, S., Sperzel, M., Sturton, G., Fitzgerald, M., Briggs, B., Conception, A., (Bayer Atkiengesellschaft, Germany) PCT Int. Appl., WO 9,802,440; C.A. **128**, 140689^t (1998).
144. Adams, S.P., Lin, K-C., Lee, W-C., Castro, A.C., Zimmermann, C.N., Hammond, C.E., Liao, Y-S., Cuervo, J-H., Singh, J., (Bigen. Inc. USA) PCT Int. Appl., WO 9,622,966; C.A. **125**, 248489^e (1996).
145. Cho, K., Rye, M., Chin, K., Hayashi, F., Go, E., Japanese Patent, JP 07002665; C.A. **122**, 274041^k (1995).
146. Braeunlich, G., Es-Sayed, M., Fisher, R., Fugmann, B., Hennigg, R., Sperzel, M., Nielsch, U., Stuborn, G., (Bayer A.G., Germany) Eur. Pat. Appl., EP 779,291; C.A. **127**, 121637ⁿ (1997).
147. Groutas, W.C., (Wichita State Univ., USA) PCT Int. Appl., WO 9,518,797; C.A. **123**, 340140^r (1995).
148. Ali, F.E., Krell, R.D., Snader, K.M., (Smithkline Corp.) Eur. Pat. Appl. EP 34,462 US Appl., 121,066; C.A. **96**, 34857^g (1982).
149. Ali, F.E., (Smithkline Corp.) Eur. Pat. Appl., EP 38,177, US Appl., 140,021; C.A. **96**, 68845^s (1982).
150. Gleason, J.G., (Smithkline Corp.) Eur. Pat. Appl., EP 40,990, US Appl., 153,653; C.A. **96**, 142723^u (1982).
151. Ali F.E., (Smithkline Corp.) U.S. Patent, US 4,314,935; C.A. **97**, 6172^g (1982).
152. Gleason, J.G., Hill, D.T., (Smithkline Corp.) U.S. Patent, US 4,350,698; C.A. **98**, 16595^g (1983).
153. Balsamo, A., Macchia, B., Macchia, M., Baldacci, M., Danesi, R., Del Tacca, M. (Laboratori Baldacci S.P.A., Italy) PCT Int. Appl., WO 97,19,091; C.A. **127**, 81641^a (1997).

154. Macchia, M., Jannitti, N., Gervasi, G., Danesi, R., *J. Med. Chem.* **39**, 1352 (1996).
155. Vogt, B.R., Cullison, D.A., Ger. Offen., 2630,602; US Appl. 595,947; C.A. **86**, 189938^b (1977).
156. Huth, A., Schmiechen, R., Kehr, W., Palenschat, D., Paschelke, G., Wachtel, H., Ger. Offen., 2,541,855; C.A. **87**, 39271^k (1977).
157. Ziegler, R., Neumann, P., Haeflinger, W., (Sandoz-Patent G.m.b.H.) Ger. Offen., DE 3,700,825; C.A. **107**, 217905 (1987).
158. Sauer, G., Huth, A., Wachtel, H., Schneider, H.H., (Schering A.G.) Eur. Pat. Appl., EP 160,842, DE Appl. 3,413,657; C.A. **105**, 43142^b (1986).
159. Sauer, G., Huth, A., Wachtel, H., Schneider, H.H., (Schering A.G.); Ger. Offen., DE 33,413,657; C.A. **105**, 43139^f (1986).
160. Ziegler, R., Neumann, P., Haeflinger, W., (Sandoz A.G., Switz.) Brit Pat. Appl., G.B. 2185743; C.A. **107**, 198727 (1987).
161. Valenta, V., Metysova, J., Protiva, M., Czech., CS 257,341; C.A., **111**, 194782^k (1989).
162. Mendez, J.C., Diaz, M.P., Bellver, R.C., Sollhuber, M.M., *Eur. J. Med. Chem.*, **27**, 61 (1992).
163. Georgiev, V.S., U.S. Patent, US 4,692, 515; C.A. **108**, 55766^h (1988).
164. Lo, Y.S., Walsch, D.A., Uwaydah, I.M., (Robins, A.H., Co. Inc. USA); C.A. **115**, 255820^c (1991).
165. Maryanoff, B.E., Nortey, S.O., Gardocki, J.F., Shank, R.P., Dodgson, S.P., *J. Med. Chem.*, **30**, 880 (1987).
166. Court, J.J., Desai, R.C., Hlasta, D.J., (Sterling Winthrop Inc. USA) U.S. Patent 5, 494, 925; C.A. **124**, 343311^d (1996).
167. Dorn, C.P., Finke, P.E., Maccoss, M., Doherty, J.B., Shah, S.K., Hagmann, W.K., (Merck and Co. Inc.) Eur. Pat. Appl., EP 481,671, US Appl., 597, 617; C.A. **117**, 131048^d (1992).
168. Court, J.J., Desai, R.C., (Sanofi Winthrop Inc., USA) PCT Int. Appl., WO 96,169,700; C.A. **125**, 143004^q (1996).
169. Desai, R.C., (Sanofi Winthrop, Inc, USA) PCT Int. Appl., WO 9,616,654; C.A. **125**, 132806^b (1996).
170. Haramura, M., Haneishi T., Kurumaru, K., (C and C Research Laboratories, S. Korea) PCT Int. Appl., WO 9,719,919, JP Appl., 95/313,407; C.A. **127**, 95609^h (1997).
171. Sederel, L.C., Van Der Does, L., Van Duijl, J.F., Beugeling T., Bantjes, A., *J. Biomed. Mater. Res.*, **15**, 819 (1981).
172. Sharma, C.P., Chandy, T., Latha, A., *Biomat. Devices Artif. Organs*, **12**, 215 (1984).

173. Crassous, G., Jozefowics, M., Sledz, J., *Biomaterials*, **5**, 153, (1984).
174. Ito, Y., Iguchi, Y., Imanishi, Y., *Biomaterials*, **13**, 131 (1992).
175. Sederel, L.C., Van der Does, L., Euverman, B.J., Bantjes, A., Kluff, C., Kempen, H.J.M., *Biomaterials*, **4**, 3 (1983).
176. Hayashi, Y., Harada, T., Katada, J., Tachiki, A., Okazaki, T., Satoh, Y., Miyazaki, H., Asari, T., (Nippon Steel Corporation, Japan) PCT Int. Appl., WO 9,620,172; C.A. **125**, 167803 ^a (1996).
177. Crassous, G., Jozefowicz, M., Sledz, J., *Biomaterials*, **5**, 153 (1984).
178. Mendjel, H., Sledz, J., Schue, F., Paleirac, G., *Macromol. Chem. Rapid Commun.*, **5**, 669 (1984).
179. Crassous, G., Harjanto, F., Mendjel, H., Sledz, H., Schue, F., Mayer, G., Jozefowicz, M., *J. Memb. Sci.*, **22**, 269 (1985).
180. Mendjel, H., Harjanto, F., Crassous, G., Sledz, J., Schue, F., Meyer, G., *Eur. Polym. J.*, **21**, 651 (1985).
181. Sharma, C.P., Chandy, T., Latha, A., *Biomat. Med. Devices, Artif. Organs*, **12**, 215 (1985).
182. Mendjel, H., Sledz, J., Schue, F., Paleirac, G., *Der. Hematol. Immunol.*, **14**, 221 (1986).
183. Gebelein, C.G., Murphy, D., *Polymer. Sci. Technol.* (Plenum), **35**, 277 (1987) (*Adv. Biomed. Polym.*).
184. Joseph, G., Sharma, C.P., *Curr. Sci.*, **54**, 1068 (1985).
185. Gebelein, C.G., Murphy, D., *Polym. Mater. Sci. Eng.*, **53**, 415 (1985).
186. Harjanto, F., Mendjel, H., Sledz, J., Schue, F., Meyer, F., *Makromol. Chem.*, **186**, 559 (1985).
187. Parmeswaran, K.N., Shi, G.Y., Klotz, M., *J. Med. Chem.*, **30**, 936 (1987).
188. Shimazaki, N., Watanabe, S., Sawada, A., Henmi, K., (Fujisawa Pharmaceutical Co. Japan), Japanese Patent, JP 0,8119,936; C.A. **125**, 142547 ^g (1996).
189. Zablocki, J.A., Tjoeng, F.S., Bovy, R.P., Miyano, M., Garland, R.B., Williams, K., Schretzman, L., Zupee, M.E., Rico, J.G., et al., *Bioorg. Med. Chem.*, **3**, 539, (1995).
190. Rao, K.R., Nageswar, Y.V.D., Diwan, P.V., Rao, A.B., Sattur, P.B., Thagirajan, G., Indian Patent, IN 164,008; C.A. **112**, 55593 ^g (1990).
191. Sarges, R., (Pfizer Inc.) U.S. Patent, US 4,286,098; C.A. **95**, 203958 ^c (1958).
192. Alessi, T.R., Elligboe, J.W., (American Home Product Corp.) U.S. Patent, US 4,895,860; C.A. **113**, 40693 ^m (1990).
193. Sarges, R. (Pfizer Inc.) U.S. Patent, US 4,348,526; C.A. **98**, 72093 ^d (1983).

194. Hutchinson, A.J., (Pfizer Inc.) US Appl., 310, 682; C.A. **99**, 194944^y (1983).
195. Oosowa, T., Nakao, T., Miwa, A., Japanese Patent, JP 06,228,095; C.A. **123**, 143632^b (1995).
196. Nishikibe, M., Kamei, K., Nagura, J., Fukuroda, T. (Banyu Pharm. Co., Ltd., Japan) Eur. Pat. Appl., EP 311053; C.A. **112**, 151868^w (1990).
197. Lo, Y.S., Nolan, J.C., Shamblee, D.A., U.S. Patent, US 5,192,785; C.A. **119**, 249709^a (1993).
198. Katritzky, A.R., Caster, K.C., Maren, T.H., Conroy, C.W., Bar-Illan, A., *J. Med. Chem.*, **30**, 2058 (1987).
199. Kanano, K., Ochi, S., Hachisu, M., Yoshida, S., Sinohara, A., Shimoyama, Y., Taniguchi, Y., Kashima, S., Tsuruoke, T., Inoue, S., (Meiji Seika K.K.) Japanese Patent, JP 0,466,571; C.A. **117**, 111483^p (1992).
200. Ishikawa, K., Hayama, T., Nishikibe, M., Yano, M., (Banyu Pharmaceutical Ltd.) Eur. Pat., EP 501,693; C.A. **117**, 251243^k (1992).
201. Patchat, A.A., Harris, A.E., Eyvrat, M.J., Tristram, E.W., Eur. Pat. Appl., 12,401; US Appl., 968,249; C.A. **95**, 25634^j (1981).
202. Miyano, T., Suzuki, K., Harada, N., (Banyu Pharmaceutical Co. Ltd.) Eur. Pat. Appl., EP 63,747; C.A. **98**, 160588^z (1983).
203. Wikstrom, H.V., Carlsson, P.A.E., Andersson, B.R., Sevansson, K.A.I., Elebring, S-T, Stjernlof, N.P., Romero, A.G., Haadsma, S.R., Lin, C.H., Ennis, M.D., (Up-John Co., USA) PCT Int. Appl., WO 9111435; C.A. **115**, 232076^a (1991).
204. Shimizu, S., Japanese Patent, JP 02212488; C.A. **114** 81809^t (1991).
205. Miyano, T., Suzuki, K., Ushijima, R., Nakagawa, S., (Banyu Pharmaceutical Co. Ltd.) Eur. Pat. Appl., EP 101,023; C.A. **101**, 23346^k (1984).
206. Miyano, T., Suzuki, K., (Banyu Pharmaceutical Co. Ltd.) Japan Kokai Tokkyo Koho, JP 60,139,671 [85,139,671]; C.A. **104**, 50795^z (1986).
207. Berthold, R., Ott, H., (Sandoz S.A.) Fr. Demande, FR 2,567,885 DE Appl., 3,426, 630; C.A. **105**, 172505^w (1986).
208. Berthold, R., Ott, H., (Sandoz-Patent-G.m.b.H.) Ger. Offen., DE 3,524,955; C.A. **106**, 84635^a (1987).
209. Ohno, T., Yano, S., Fujiwara, K., Ajioka, H., Yammamoto, N., Yamada, S., Kajitani, M., (Taiho Pharm. Co. Ltd., Japan), PCT Int. Appl., WO 9,220,666; C.A. **119**, 8837^z (1993).
210. Crisp, H.A., Clayton, J.C., Elliott, L.G., Wilson, E.M., (Glaxo Group Ltd.) Gen. Offen., DE 3,327,449; C.A. **101**, 78882ⁿ (1984).
211. Schue, F., Mendjel, H., El Harfi, A., Sledz, J., Palerac, G., Orsetti, A., Bouhaddioui,

- N., Crespy, S., *Dev. Hematol. Immunol.*, **14**, 233 (1986).
212. Schue, F., Mendjel, H., el Harfi, A., Sledz, J., Paleirac, G., Orsetti, A., Bouhaddioui, N., Crespy, S., *Life Support Syst.*, **4**, 386 (1986).
213. Takayama, K., Hishamichi, H., Iwata, M., Kubota, H., Aoki, M., (Yamanouchi Pharmaceutical Co. Ltd.) PCT Int. Appl., WO 9719,078, JP Appl. 96/141,868; C.A. **127**, 65784^u (1997).
214. Jakobsen, P., Kanstrup, A., Faarup, P., Olesen, H.P., (Novo Nordisk A/S) PCT Int. Appl., WO 94,26,735; C.A. **123**, 198629^m (1995).
215. Schering A.G., Israeli IL 50,451; C.A. **98**, 89162^y (1983).
216. Picard, J.A., O'Brien, P.M., Sliskovic, D.R., Anderson, M.K., Bousley, R.F., Hemelehle, K.L., Krause, B.R., Stanfield, R.L., *J. Med. Chem.*, **39**, 1243 (1996).
217. Lee, H.T., Picard, J.A., Sliskowic, D.R., Wierenga, W., (Warner Lambert Co.) PCT Int. Appl., WO 9,426,702; C.A. **123**, 143436^r (1995).
218. Aebi, J., Lengsfeld, H., Dehmlow, H., Morand, O., Himher, J., Schmid, G., Maerki, H-P, Ji, Y-H (Hoffmann - La Roche Ag. Switz.) Eur. Pat. Appl., EP 778, 271; C.A. **127**, 108921^f (1997).
219. Cozzi, P., Menchetti, P., Fusar, D., DeCarneri, I., Trane, F., Bianchi, A., *Eur. J. Med. Chem.-Chim. Ther.*, **18**, 203 (1983).
220. Roesner, M., Unbanietz, J., Loewe, H., Duetzel, D., Kirsch, R., (Hoechst A.G.) Ger. Offen., DE 3,232,959; C.A. **101**, 23149^v (1984).
221. Sidebottom, P.J., Lester, M.G., Procopiou, P.A., Watson, N.S., Bell, R., Gerard, M.P., Bailey, E.J., Kirk, B.E., Smith, C., (Glaxo Group Ltd.) Eur. Pat., EP 497,091; C.A. **117**, 234022^v (1992).
222. Fernandez - Resa, P., Garcia-Lopez, M.T., De Las Heras, F.G., Sanfelix, A., Alarcon, B., Carrasco, L., *Eur. J. Med. Chem.-Chim. Ther.*, **21**, 245 (1986).
223. Camarasa, M.J., Fernandez-Resa, P., Garcia-Lopez, Maria, T., De Las Heras, F.G., Mendez-Castrillon, P.P., Alarcon, B., Carrasco, L., *J. Med. Chem.*, **28**, 40 (1985).
224. Adams, C.D., U.S. Patent, US 4,010,278; C.A. **86**, 171121^v (1977).
225. Wyvratt, M., Devita, R.J., Bochis, R., Schoen, W., (Merck and Co., Inc., USA) U.S. Patent, US 5,672,596, WO Appl., 931/US 7,791; C.A. **127**, 318890^w (1997).
226. Chu, L., Fischer, M.H., Mrozk, H., Schoen, W.R., U.S. Patent 5,284,841; C.A. **122**, 81146^q (1995).
227. Bochis, R.J., Fisher, M.H., Devita, R.J., Schoen, W.R., Wyvratt, M.J., PCT Int. Appl., WO 94,07,486; C.A., **122**, 239557^m (1995).
228. Pisano, J.M., Schoen, W.R., Wyvratt, M.J., (Merck and Co., Inc.) PCT Int. Appl., WO 94,11,012; C.A., **122**, 240444^d (1995).

229. Fischer, M.H., Mrozik, H., Schoen, W.R., Shih, T.L., Wyvratt, M.J., (Merck and Co., Inc.) PCT Int. Appl., WO 9,516,692; C.A. **123**, 340138^w (1995).
230. Schoen, W.R., Pisano, J.M., Prendergast, K., Wyvratt, M.J., Fischer, M.H., Cheng, K., Chan, W-S., Butler, B., Smith, R.G., Ball, R.G., *J. Med. Chem.*, **37**, 897 (1994).
231. Matsuo, M., Hagiwara, D., Miyake, N., (Fujisawa Pharm. Co., Ltd. Japan) Eur Pat. Appl., EP 333,174; C.A. **112**, 158977^q (1990).
232. Audiav, F., Jimonet, P., Mignani, S., PCT Int. Appl., WO 9,420,109; C.A. **121**, 308316^a (1994).
233. Burkholder, T.P., Litiou-Binh Kudlacz, E.M., Maynard, G.D., PCT Int. Appl., WO 9,426,735; C.A. **123**, 198629^m (1995).
234. Lardy, C., Guerrier, D., Chavernac, G., Collonges, F., (Lipha, Lyonnaise Industrielle Pharmaceutique) Eur. Pat. Appl., EP 472,420; C.A. **116**, 235242^h (1992).
235. Hayashi, K., Yamamori, T., Kanda, Y., (Shiongi and Co., Ltd., Japan) PCT Int. Appl., WO 9,710,214; C.A. **126**, 251151^q (1997).
236. Berger, J., Carter, D.S., Flippin, L.E., Weinhardt, K.K., (F. Hoffmann - La Roche Ag. Switz.) PCT Int. Appl., WO 9,700,872; C.A. **126**, 186085^c (1997).
237. Oku, T., Setoi, H., Kayakiri, H., Satoh, S., Inoue, T., Saitoh, Y., Kuroda, A., Tankaa, H., (Fujisawa Pharm. Co., Ltd. Japan) Eur Pat. Appl., EP 480,204; C.A. **117**, 26566^y (1992).
238. Kuhla, D.E., Campbell, H.F., Studt, W.L., Dodson, S.A., Glemmo, (Jr.), R.A., Durham, P.J., (Roter International Inc.) PCT Int. Appl., WO 8,505,105; U.S. Appl., 604,988; C.A. **105**, 191140^q (1986).
239. Brown, F.J., Bernstein, P.R., Yu, K.K., Matassa, V.G., (ICI Americas, Inc.) Eur. Pat. Appl., EP 199,543; C.A. **106**, 176163^b (1987).
240. Otto, F., Duerckeimer, W., Muschaweck, R., (Hoechst A.G.) Ger. Offen., 2,409,355; C.A. **84**, 59606^v (1976).
241. Picard, J.A., Sliskovic, D.R., (Warner Lambert Co.) PCT Int. Appl., WO 9,207,826; C.A. **117**, 89976^c (1992).
242. Picard, J.A., Sliskovic, D.R., (Warner Lambert Co.) PCT Int. Appl., WO 9,208,693; U.S. Appl., 610,487; C.A. **117**, 111279^b (1992).
243. Picard, J.A., Sliskovic, D.R., (Warner Lambert Co.) PCT Int. Appl., WO 9,208,694; U.S. Appl., 610,287; C.A. **117**, 111280^v (1992).
244. Salituro, F., Galullo, V., Bellon, S., Bemis, G., Cochran, J., (Vertex Pharm. Inc.) PCT Int. Appl., WO 9,958,502.
245. McDonald, I., Dunstone, D., Tozer, M., (James Black Foundation Ltd.) PCT Int. Appl., WO 9,905,141.

246. Picard, J.A., Sliskovic, D.R., (Warner Lambert Co.) PCT Int. Appl., WO 9,208,692; U.S. Appl., 611,245; C.A. **117**, 150732^p (1992).
247. Baxter, A.J.G., Dickinson, K.H., Pobert, P.M., Southgate, R., Ger. Offen., 2,811,514; C.A. **90**, 22800^w (1979).
248. Vazquez, M.L., Mueller, R.A., Talley, J.J., Getman, D.P., De Crescenzo, G.A., Sun, E.T., (Searle, G.D., and Co., Monsanto Co.) PCT Int. Appl., WO 9,410,136; C.A. **122**, 188162^u (1995).
249. Bacque, E., Bashiardes, G., Dereu, N., Nemecek, C. (Rhone Poulenc Rorer S.A.) PCT Int. Appl., WO 9,700,073; C.A. **126**, 157394^z (1997).
250. Tsutsumi, K., Inaba, T., Tanaka, T., (Japan Tobacco Inc. Japan) PCT Int. Appl. WO 9,629,307; C.A. **126**, 7976^b (1997).
251. Cooper, K., Littman, B.H., Pazoles, C.J., Wilner, K.D., (Pfizer Inc. USA) U.S. Patent, US 5,298,522; C.A. **120**, 315818^y (1994).
252. Sliskovic, D.R., Krause, B.R., Picard, J.A., Anderson, M., Bousley, R.F., Hamelehle, K.L., Haman., R., Julian, T.N., Rashidbaigi, Z.A., Stanfield, R.L., *J. Med. Chem.*, **37**, 560 (1994).
253. Groutas, W.C., Kuang R., Venkataraman, R., *Biochem. Biophys. Res. Commun.*, **198**, 341 (1994).
254. Moody, C.J., Swann, E., *Tet. Lett.*, **34**, 1987 (1993).
255. Shah, S.K., Dorn, C.P. Jr., Finke, P.E., Hale, J.J., Hagmann, W.K., Bruse, K.A., Chandler, G.O., Kissinger, A.L., Ashe, B.M., *J. Med. Chem.*, **35**, 3745 (1992).
256. Elloumi, N., Moreau, B., Aguiar, L., Jaziri, N., Sauvage, M., Hulen, C., Capmau, M.L., *Eur. J. Med. Chem.*, **27**, 149 (1992).
257. Lyle, T.A., Wiscount, C.M., Guare, J.P., Thompson, W.J., Anderson, P.S., Darke, P.L., Zugay, J.A., Emini, E.A., Schlieff, W.A., *J. Med. Chem.*, **34**, 1228 (1991).
258. Peter, H., Moerker, T., (Ciba Geigy A. G.) Eur. Pat. Appl., EP 300,969; C.A. **110**, 193665^s (1989).
259. Peter, H., Moerker, T., (Ciba Geigy A.G.) Eur. Pat. Appl., EP 300,966, CH Appl., 87/2,792; C.A. **111**, 78599^g (1989).
260. Tang, H., Xie, L., Wijesekera, T., Dolphin, B., (Quadra Logic Technologies Inc.) PCT Int. Appl., 29,180, US Appl., 233,632; C.A. **124**, 116966^c (1996).
261. Kaneko, T., Clark, R., Ohi, N., Ozaki, F., Kawahara, T., Kamada, A., Okano, K., Yokohama, H., Muramoto, K., Arai, T., Ohkuro, M., Takenaka, O., Sonoda, J., (Eisai Co., Ltd. Japan) PCT Int. Appl., WO 9,806,720; C.A. **128**, 126254^f (1998).
262. Titman, R.B., Hockley, M.H., (Boots Co. Plc, UK) PCT Int. Appl., WO 9,112,255 C.A. **115**, 280017^d (1991).

263. Iwazawa, Z., Fukami, T., Nagura, J., Fukuroda, N., Japan Kokai, 01,168,684; C.A. **112**, 35,35873^v (1990).
264. Dyke, H.J., Montana, J., (Chiroscience Ltd, UK) PCT Int. Appl., WO 9,636,596; C.A. **126**, 89137 (1996).
265. Guthikonda, R.K., Hagmann, W.K., William, K., Maccoss, M., Shah, S.K., Durette, P.L., (Merck and Co., Inc. USA) PCT Int. Appl., WO 9618617; C.A. **125**, 114503^w (1996).
266. Magerlein, B., Kim, K.S., Eur. Pat., EP 246,786; C.A. **109**, 92647^m (1988).
267. Albercht, H.A., Konzelmann, F.M., Keith, D.D., (Hoffmann-La Roche, Inc.) U.S. Patent, US 4,831,130; C.A. **111**, 194452^c (1989).
268. Ohashi, T., Suga, K., Sada, I., Miyama, A., Watanabe, K., (Kanegafuchi Chemical Industry Co. Ltd.) Japanese Patent, JP 0,276,888; C.A. **113**, 131877^r (1990).
269. Kinoshita, K., Miyama, A., Matsumoto, S., Nagashima, N., Suga K., Ohashi, T., (Kanegafuchi Chemical Industry Co. Ltd.) Japanese Patent, JP 04,112,867; C.A. **117**, 171078^v (1992).
270. Breuer, H., U.S. Patent, US 4,772,693; C.A. **110**, 134969^w (1989).
271. Breuer, H., Treuner, U.D., (Squibb Corp.) U.S. Patent, US 4,762,922; C.A. **110**, 114560^c (1989).
272. Kim, K.S., (Upjohn Co.) Eur. Pat. Appl., EP 300,636; C.A. **111**, 39096^w (1989).
273. Godfrey, J.D., Jr., Mueller, R.H., Zahler, R., (Squibb, E.R., and Sons, Inc.) Eur. Pat. Appl., EP 321,844; US Appl., 135,802; C.A. **112**, 7262^b (1980).
274. Breuer, H., Drossard, J.M., Ermann, P.H., Sraub, H., Treuner, U.D., Eur. Pat. Appl., EP 251143; C.A. **109**, 22759^a (1988).
275. Miyama, A., Matsumoto, S., Kamiyama, N., Suga, K., Ohashi, T., (Kanegafuchi Chemical Industry Co. Ltd. Japan) Japanese Patent, JP 03,020,287; C.A. **114**, 247,046^u (1991).
276. Ohashi, T., Kan, K., Ueyama, N., Sada, I., Watanabe, K., (Kanegafuchi, Chem. Industry Co. Ltd. Japan) Eur. Pat. Appl., EP 230,248; C.A. **107**, 217365^k (1987).
277. Furlenmeier, A., Hofheinz, W., Hubschwerlen, C.N., Isering, H.P., (Hoffmann-La Roche, Inc. USA) U.S. Patent, US 4,652,651 C.A. **107**, 154164^w (1987).
278. Breuer, H., Denzel, T., Treuner, U.D., (Von Heydeng G.m.b.H.) Ger. Offen., DE 3,229,439; C.A. **99**, 5436^z (1983).
279. Furlenmeier, A., Hubschwerlen, C.N., Hofheinz, W., Isenring, H.P., (Hoffmann-La Roche, F., Und Co., A.G.) Eur. Pat. Appl., EP 96,297; C.A. **100**, 174525^y (1984).
280. Furlenmeier, A., Hofheinz, W., Hubschwerlen, C.N., Isenring, H.P., (Hoffmann-La Roche, F., Und Co., A.G.) Eur. Pat. Appl., EP 96296; C.A. **100**, 191650^c (1984).

281. Buynak, J.D., Rao, M.N., Pojouhesh, H., Chandrasekaran, R.Y., Finn, K., DeMeester, P., Chu, S.C., *J. Org. Chem.*, **50**, 4245 (1985).
282. Sendai, M., Hashiguchi, S., Tomimoto, M., Kishimoto, S., Matsuo, T., Kondo, M., Ochiai, M., *J. Antibiot.*, **38**, 346 (1985).
283. Schmid, G., (Hoffmann-La Roche, F., Und Co., A.G.) Eur. Pat. Appl., EP 179318; CH Appl. 84/4,995; C.A. **105**, 72174ⁿ (1986).
284. Menard, M., Martel, A., (Bristol Myers Co.) US 4,272,437; C.A. **95**, 203941^s (1981).
285. Miyama, A. Kamiyama, N., Matsumoto, S., Kan, K., Ohashi, T., (Kanegafuchi Chemical Industry Co. Ltd. Japan) Japanese Patent, JP 02290888; C.A. **114**, 228710 (1991).
286. Christensen, B.G., Guthikonda, R.N., Ratcliffe, R.W., (Merck and Co. Inc.) U.S. Patent, US 4,217,453; C.A. **93**, 239222^f (1980).
287. Christensen, B.G., Guthikonda, R.N., Ratcliffe, R.W., (Merck and Co. Inc.) U.S. Patent, US 4,217,453; C.A. **93**, 239222^e (1980).
288. Christensen, B.G., Johnston, D.B.R., Schmitt, S.M., (Merck and Co. Inc.) U.S. Patent, US 4,264,621; C.A. **95**, 61986^d (1981).
289. Singh, R., Cooper, R.D.G., *Tetrahedron*, **50**, 12049, (1994).
290. (Beecham Group Ltd.) Japanese Patent, 7,948,786; C.A. **91**, 157593^x (1979).
291. Smale, T.C., (Beecham Group Ltd) Eur. Patent, 2,564; C.A. **92**, 76279ⁱ (1980).
292. Christensen, B.G., Johnston, D.B.R., Schmitt, S.M., (Merck and Co. Inc.) Ger. Offen., 2,751,597, US Appl., 743,365; C.A. **90**, 6241^j (1979).
293. (Merck and Co., Inc.) Japanese Patent 7,966,696; US Appl. 843,375; C.A. **91**, 211257^f (1979).
294. (Merck and Co., Inc.) Japanese Patent, 7,966,697; US Appl., 843,378; C.A. **92**, 180991^e (1980).
295. Christensen, B.G., Guthikonda, R.K., Ratcliffe, R.W., (Merck and Co., Inc.) U.S. Patent, US 428,741; C.A. **96**, 68720^x (1982).
296. Christensen, B.G., Johnston, D.B.R., Schmitt, S.M., (Merck and Co. Inc.) U.S. Patent, US 4,347,368; C.A. **98**, 53525^e (1983).
297. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) U.S. Patent, US 4,350,631; C.A. **98**, 53535^h (1983).
298. Favara, D., Omodei - sale, A., Consonni, P., (Gruppo, Lepetil s.p.a.) Eur. Pat. Appl., EP 60,416; GB Appl., 81/7,865; C.A. **98**, 89060^p (1983).
299. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) Eur. Pat. Appl., EP 54,917; US

- Appl., 217,931; C.A. **98**, 16501^y (1983).
300. Murata, M., Tsutsumi, H., Satsutda, K., Hattori, K., Nakajimi, T., (Fujisawa Pharm. Co., Ltd. Japan) Eur. Pat. Appl., EP 272,455; C.A. **109**, 210794^g (1988).
301. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) Eur. Pat. Appl., 10,316; US Appl., 954,271; C.A. **93**, 220577^d (1980).
302. Cama, L.D., Christensen, B.G., Guthikonda, R.N., (Merck and Co. Inc.) US Appl., 4,218,459; C.A. **94**, 30564^v (1981).
303. Hungerbuhler, E., Eur. Pat. Appl., 259,268; C.A. **109**, 73244^m (1988).
304. Ohashi, T., Kan, K., Ueyama, N., Sada, I., Miyama, A., Watanare K., U.S. Patent, US 4791,198; C.A. **111**, 133899^g (1989).
305. Onoue, H., Ubukawa, Y., (Shionogi and Co., Ltd) Japanese Patent, JP 01,279,888; C.A. **113**, 40331^s (1990).
306. Cama, L.D., Christensen, B.G., Bouffard, F.A., Johnston, D.B.R. (Merck and Co. Inc.) Ger. Offen., 2,751,624; US Appl. 743,363; C.A. **90**, 203858^e (1979).
307. Cama, L.D., Christensen, B.G., (Merck and Co. Inc.) U.S. 4287/04; C.A. **95**, 150659^x (1981).
308. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) U.S. Patent. US. 4,341,706; C.A. **98**, 107065^a (1983).
309. Favara, D., Omodei-Sale, A., Consonni, P., Depaoli, A., *Tet. Lett.*, **23**, 3105 (1982).
310. Aihara, K., Kano, Y., Shiokawa, S., Sasaki, T., Setsu, F., Toyooka, Y., Ishii, M., Atsumi, K., Iwamatsu, K., Tamura, A., (Meiji Seika Kabusiki, Kaisha, Japan) PCT, Int Appl., WO 9,628,455; C.A. **125**, 328383^f (1996).
311. Iso, Y., Irie, T., Iwaki, T., Kii, M., Sendo, Y., Motokawa, K., Nishitani, Y., *J. Antibiot.*, **49**, 478 (1996).
312. Terajima, A., Ito, Y., Kobayashi, Y., (Sagami Chemical Research Centre, Japan) Japanese Patent, JP 02,172,987; C.A. **114**, 206881 (1991).
313. Onoue, H., Narukawa, Y. *J. Antibiot.*, **42**, 1100 (1989).
314. Christensen, B.G., Leanza, W.J., Ratcliffe, R.W., Shih, D.H., (Merck and Co. Inc.) Eur. Pat. Appl., EP 71,908; US Appl., 289,345; C.A. **99**, 53468^j (1983).
315. Cecchi, R., Favara, D., Omodei-sale, A., Depaoli, A., Consonni, P., *Gazz. Chim. ital*, **114**, 225 (1984).
316. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) Eur. Patent, 10,317; US 954,275; C.A. **94** 3918^g (1981).
317. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) U.S. Patent, US 4,262,009; C.A. **95**, 42903^p (1981).

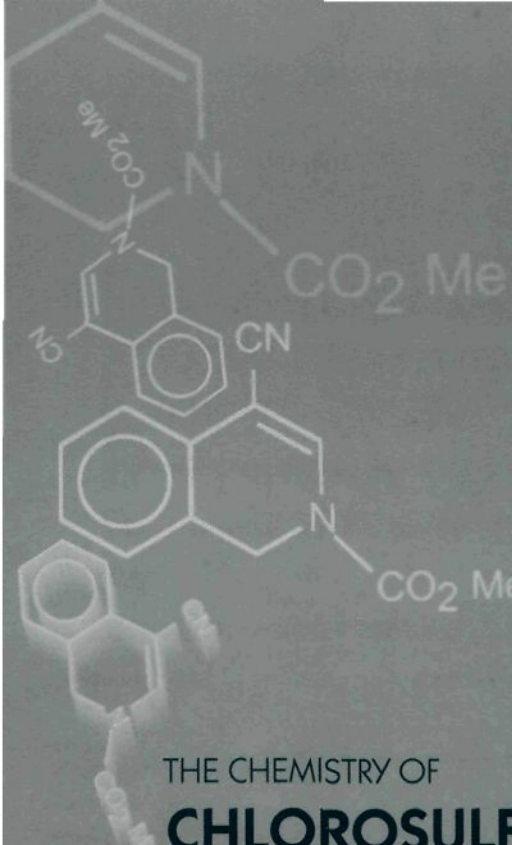
318. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) U.S. Patent., US 4,262,010; C.A. **95**, 61981^d (1981).
319. Christensen, B.G., Johnston, D.B.R., Schmitt, S.M., (Merck and Co. Inc.) U.S. Patent US 4,269,873; C.A. **95**, 61983^f (1981).
320. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) Eur. Pat. Appl., EP 113,101; US Appl., 454,796; C.A. **102**, 6057^v (1985).
321. Christensen, B.G., Firestone, R.A., U.S. Patent 3,775,410; C.A. **80**, 70823^w (1974).
322. Rogers, N.H., Stevenson, R., (Beecham Group Ltd.) Ger. Offen., 2,550,157; C.A. **85**, 123946^a (1976).
323. Rogers, N.H., Hunt, E., Ger. Offen., 2,555,159; C.A. **86**, 29839^s (1977).
324. Christensen, B.G., Firestone, R.A., Can 992,956; C.A. **87**, 39512^q (1977).
325. Beeby, P.T., (Syntex USA, Inc.) US 4,094,978; C.A. **89**, 215424^q (1978).
326. Tsuruoka, T., Ogino, H., Katano, K., Iwamatsu, K., Nakabayashi, A., Katano, T., Kondo, S., (Meiji Seika Kaisha Ltd.) Jpn. Kokai Kokkyo Koho, JP 0166,191 [8966,191]; C.A. **111**, 173899^p (1989).
327. Tanaka, M., Matsuda, K., Japanese Patent, JP 05,213,968 [93213,968]; C.A. **120**, 134147^h (1994).
328. Cook, M.C., Gregory, G.I., Bradshaw, J., (Glaxo Laboratories Ltd.) Ger. Offen., 2,439,880., Brit. Appl., 39,645/73; C.A. **83**, 43354^z (1975).
329. (Ciba Geigy A.G.) Japanese Patent, JP 8199, 488; CH Appl., 79/11,406; C.A. **96**, 6472^d (1982).
330. Christensen, B.G., Johnston, D.B.R., Firestone, R.A., (Merck and Co. Inc.) U.S. Patent US 4,296,236, GB Appl., 71/13008; C.A. **96**, 122515^z (1982).
331. Farge, D., Le Roy, P., Moutonnier, C., Peyronel, J.F., Ger. Offen., 3,019,462; Fr. Appl., 79/13,096; C.A. **95**, 187274^u (1981).
332. Farge, D., Le Roy, P., Moutonnier, C., Peyronel, J.F., Ger. Offen., 3,019,445; Fr. Appl., 79/13,097; C.A. **95**, 7307^a (1981).
333. Kocsis, K., Schneider, P., Fechtig, B., Scartazzini, Eur. Pat. Appl., 16900; Lux Appl., 77,188; C.A. **94**, 192,357^b (1981).
334. Farge, D., Le Roy, P., Moutonnier, C., Peyronel, J.F., Ger. Offen., 3,019,430; Fr. Appl., 79/13,097; C.A. **95**, 7308^b (1981).
335. Mikolajczyk, J., Oszczapowicz, I., Zukowski, E., Sikora, A., Moren-Lech, I., (Osrodek Badawczo - Rozwojowy Biotecnologii, Pol.) Polish Patent, PL 156,026; C.A. **119**, 203230^y (1993).
336. Sasho, M., Yamauchi, H., Yamanaka, M., Nakamura, T., Katsu, K., Sugiyama, I., Kamatu, Y., Negi, S., (Eisai Co. Ltd. Japan) Eur. Pat. Appl., EP 408,034; C.A. **115**,

- 8420 (1991).
337. Watanabe, Y., Yokoo, C., Goi, M., Onodera, A., Murata, M., Fkushima, H., Sota, K., (Taisho Pharm. Co. Ltd. Japan) Eur. Pat. Appl., EP 210,078; C.A. **107**, 7000^m (1987).
338. Crip, H.A., Wright, M., Turnbull, J.P., Oughton, J.F., (Glaxo Group Ltd.) Ger. Offen., DE 3,427,828; GB Appl., 83/20,521; C.A. **103**, 22376^z (1985).
339. Weingarten, G.G., (Glaxo Group Ltd.) Ger. Offen., DE 3,500,090; C.A. **104**, 109344^g (1986).
340. Greengrass, C.W., Hoople, D.W.T., Howarth, T.T., (Pfizer Corp.) Eur. Pat. Appl., EP 168,177, GB Appl., 84/16,498; C.A. **105**, 78755^f (1986).
341. Nishimura, T., Tsushima, S., Ger. Offen., 2,818,025; Japanese Appl., 77/49,276; C.A. **90**, 72220^c (1979).
342. Myake, A., Nakao, M., Japanese Patent, JP 06,128,268; C.A. **121**, 300664^s (1994).
343. Takaya, T., Sakane, K., Miyai, K., Kawabata, K., (Fujisawa Pharmaceutical Co., Ltd.) Eur. Pat. Appl., EP 306,863; C.A. **111**, 133908^j (1989).
344. Sakane, K., Kawabata, K., Miyai, K., Inamoto, Y., (Fujisawa Pharmaceutical Co., Ltd.) Eur. Pat. Appl., EP 307,804; C.A. **111**, 153514^f (1989).
345. Christensen, B.G., Cama, L.D., Kern, J.A. (Merck and Co. Inc.) Ger. Offen., 2,264,651; C.A. **81**, 120653^j (1974).
346. Mayake, A., Nakao M., (Takeda Chem. Industr. Ltd., Japan), Japanese Patent, JP 07,101,958; C.A. **123**, 111748^c (1995).
347. Oohashi, T., Suga, K., Sada, I., Myama, A., Watanabe, K., Japanese Patent JP 01,131,188 [89,131,188]; C.A. **112**, 35555^t (1990).
348. Barbachyn, M.R., (Upjohn Co. USA) PCT Int. Appl., WO 8,806,155; C.A. **110**, 154036^t (1989).
349. Omodei, S., Amedeo, F., Duccio, C., Pietro, C.R., (Gruppo Lepetit S.p.A.); C.A. **101**, 110624^t (1984).
350. Ohashi, T., Kan, K., Sada, I., Miyama, A., Watanabe, K., (Kanegafuchi Chemical Industry Co. Ltd.) Eur. Pat. Appl., EP 167,155, JP Appl 84/139,797; C.A. **105**, 60469^t (1986).
351. Hayashibara, T., Ogiwara, S., Nakamura, A., Japanese Patent, JP 08,157,441; C.A. **125**, 195286^c (1996).
352. Christensen, B.G., Shih, D.H., (Merck and Co. Inc.) U.S. Patent 4,262,011; C.A. **95**, 42902ⁿ (1981).
353. Menard, M., Martel, A., (Bristol Myers Co.) U.S. Patent, US 4,282,150; C.A. **95**, 203944^v (1981).
354. (Bristol Myers Co.), Ger. Offen., 2,950,898; C.A. **94**, 30747^g (1981).

355. Lombardi, P., (Farmitalia Carlo Erba sp.A) Belg., BE 889,504; C.A. **96**, 142566^v (1982).
356. Longo, A., Bedeschi, A., Lombardi, P., Gandolfi, C., Franceschi, G., *Gazz Chim. ital.*, **111**, 371 (1981).
357. Ishiguro, M., Tanaka, R., Nami, K.K., Nasu, T., Inove, H., Nakatsuka, T., Oyama, Y.I.S., *J. Med. Chem.*, **40**, 2126 (1997).
358. Fechtig, B., Kocsis, K., Bickel, H., (Ciba Geigy, A.G.) Ger. Offen., 2,312,330; C.A. **80**, 3511^e (1974).
359. Van Der, D., Johannes, K., Brauynes, C.A., (Gist-Brocades N.V.) Ger. Offen., 2,405,894; C.A. **82**, 43439^k (1975).
360. Cho, Y.S., Ha Y-J., Pae, A.N., Choi, K.I., Koh, H.Y., Woo, E-R., Chang, M.H., Chung, B.Y., *Korean J. Med. Chem.*, **6**, 239 (1996); C.A. **126**, 144008^b (1997).
361. Christensen, B.G., Cama, L.D., (Merck and Co. Inc.) Ger. Offen., 2,258,278; US Appl., 203,057; C.A. **79**, 53342^a (1973).
362. Barash, L., Christensen, B.G., Hannah, J., Leanza, W.J., Shih, D.H-M (Merck & Co. Inc.) Ger. Offen., 2,652,675; US Appl., 634,291; C.A. **87**, 135049^d (1977).
363. Christensen, B.G., Hannah, J., Leanza, W.J., Shih, J.H-M, (Merck & Co. Inc.) Ger. Offen., 2,652,674; C.A. **87**, 135059^q (1977).
364. Christensen, B.G., Leanza, W.J., Wildonger, K.J., (Merck & Co. Inc.) Ger. Offen., 2,652,679; US Appl., 634,296; C.A. **87**, 184362^v (1977).
365. Christensen, B.G., Leanza, W.J., (Merck & Co.Inc.) Ger. Offen., 2,724,560; C.A. **90**,137,671^x (1979).
366. (Merck & Co.Inc.), Neth. Appl., 7,706,653; C.A. **91** 5108^c (1979).
367. (Merck & Co.Inc.), Japanese Patent, 7,909,295; C.A. **91**, 39310^c (1979).
368. (Merck & Co.Inc.) Fr. Demande, 2,394,548; C.A. **92**, 6405^g (1980).
369. Hill, J.M., Yu.G. Shue, Y-K., Zydowsky, T.M., Rebek, (Jr.), J., (Cubist Pharmaceutical Inc.,USA) PCT Int. Appl., WO 9,705,132; C.A. **126**, 212376^x (1997).
370. Aebi, J., Lengsfeld, H., Dehmlow, H., Morand, O., Himber, J., Schmid, G., Maerki, H-P., Ji, Y-H., (F.Hoffmann-La Roche Ag., Switz) Eur. Pat. Appl., EP 778,271; C.A. **127**, 108921^f (1997).
371. Hinks, J.D., Takle, A.K., Hunt, E., (Smithkline Beecham Plc. U.K.) PCT Int. Appl., WO 9,725,309; GB Appl., 96/16, 305; C.A. **127**, 161997^m (1997).
372. Kampe, K.D., Ertel, H., Heubach, G., (Hoechst A.G.) Swiss Patent, CH 630,342; C.A. **97**, 215783^w (1982).
373. Hermann, R., Ger. Offen., DE 1,9548,825; C.A. **127**, 148957^d (1997).

374. Cozzi, P., Menchetti, P., De Carnert, I., Trane, F., Ger. Offen., 2,842,752; Ital. Appl., 77/28, 197,03; C.A. **91**, 7433^d (1979).
375. Cozzi, P., Maggiori, S., De Carneri, I., Trane, F., (Farmitalia Carlo Erba S.p.A) Ger. Offen., 3,008,341; Ital Appl., 79/20,848; C.A. **94**, 83804^e (1981).
376. Terajima, A., Ito, Y., Kobayashi, Y., (Sagami Chem. Research Centre, Japan) Japanese Patent, JP 02,172,985; C.A. **114**, 206880^t (1991).
377. Atsumi, K., Umemura, E., Kano, J., Siokawa, M., Kudo, T., Tsushima, M., Iwamatsu, K., Aihara, K., Amano, K., Takizawa, H., (Meiji Seika Co., Japan) Japanese Patent JP 08,311,071; C.A. **126**, 103952 (1997).
378. Albrecht, H.A., Keith, D.D., Konzelman, F.M., (Hoffmann La Roche, Inc.) U.S. Patent, US 4,912,214; C.A. **113**, 58789^g (1990).
379. Evans, D.A., Biller, S.A., *Tet. Lett.*, **26**, 1907, (1985).
380. Beutel, P., Adolphi, H., Kiehs, K., (BASF A.G.) Ger. Offen., 2,249,939; C.A. **81**, 13108^p (1974).
381. Kim, K.S., PCT Int. Appl., WO 8,806,587; C.A. **110**, 38818^a (1989).
382. Zhang, Z-Y., Liu, Y., Chen, M-Q., Yang, S-Y., *Goodeng Xuexiao Huaxue Xuebao*, **15**, 1787 (1994); C.A. **123**, 33017^x (1995).
383. Camarasa, M.J., Fernandez-Resa, P., Garcia-Lopez, M.T., De Las Heras, F.G., Mendez-Castrillon, P.P., Alarcon, B., Carnasco, L., *Nucleosides Nucleotides*, **4**, 149 (1985).
384. Berredjem, M., Regainia, Z., Djahoudi, A., Dewynter, G., Montero, J., *Phosphorus, Sulfur Silicon Relat. Elem.*, **165**, 249, (2000).
385. Fernandez-Resa, P., Camarasa Rius, M.J., San Felix Garcia, A., Garcia, L., Maria, T., Gomez de Las, H.F., Mendez, C., Palmona, P., (Consejo Superios de investigaciones cientificas Y Antibiotico S.A.) Span., ES 522,926; C.A. **104**, 110126^u (1986).
386. Illian, G., Hemmerling, W., Winger, R., Ger. Offen., DE 4,100,176; C.A. **117**, 191861^y (1992).
387. Baker, C., Timmons, S.F., (Proc. SPIE-Int.Soc.Opt.Eng.1995) 2528. (Optical and Photonic Applications of Electroactive and Conducting Polymers); C.A. **124**, 160197^b (1996).
388. Krause, J., Eidschink, R., Roemer, M., Hittich, R., Weber, G., (Merck Patent G.m.b.H) Ger. Offen., DE 3,328,638; C.A. **103**, 132515^b (1985).
389. Horchler, V., Klaus, E., Weigelt, W., Dressel, J., Wissemeyer, A., Boerner, F., Kossmehl, G., (BASF) Eur. Pat. Appl., EP 1,033,365; C.A. **133**, 222340 (2000).
390. Koga, M., Tanaka, L., (Unilever N.V.) Unilever DL (Neth.) PCT Int. Appl., WO 9,741,199; US Appl., 643,088; C.A. **127**, 360265^w (1997).
391. Rueger, R., (Du Pont Nemours GmbH, Germany) Eur. Pat. Appl., EP 733,939; C.A.

- 125**, 312351 (1996).
392. Fujita, S., Harada, T., (Fuji Photo Film Co. Ltd., Japan) Japanese Patent, JP 61,128,249; C.A. **106**, 25685^x (1987).
393. Matsushita, T., Tetsunori, K., Nagase, H., Nomura, K., Jinbo, Y., Nigorikawa, K., (Fuji Photo Film Co., Ltd., Japan) Japanese Patent, JP 2,000,229,970; C.A. **133**, 200865 (2000).
394. Sato, K., Sakaguchi, S., Shirakawa, K., (Fuji Photo film Co. Ltd.) Japanese Patent, JP 08,123,023; C.A. **125**, 154394^t (1996).
395. Lotz, T.J., (Ciba Geigy A.G.) Eur. Pat. Appl., EP 97,615; C.A. **100**, 105114^b (1984).
396. Matzinger, P., (Sandoz A.G.) U.S. Patent, US 4,619,991; C.A. **106**, 103807^c (1987).
397. Anderson, D.J., (Cheveron Research Co.) U.S. Patent, 3,328,297; C.A. **67**, 66346^g (1967).
398. Bollinger, J.M., (Rohm and Haas Co.) U.S. Patent, 4,292,185; C.A. **95**, 206562^e (1981).
399. Brecht, H., Hoffman, D., (Farbwerke Hoechst A.G.) Ger. Offen., 2,334,346; C.A. **83**, 29799^x (1975).
400. Rraf, R., (Farbwerke Hoechst A.G.) Vorm Meister Lucius & Bruning Ger., 928,896; C.A. **51**, 4419^c (1957).
401. Ghatlia, N., Dhiraj, L., (Unilever N.V.) Unilever DL (Neth.) PCT Int. Appl., WO 9,741,199; US Appl 643,088; C.A. **127**, 360265^w (1997).
402. Jacobine, A.F., Glaser, D.M., (Loctite Corp.) Eur. Pat. Appl., EP 185, 476; US Appl., 675, 387; C.A. **105**, 209930^j (1986).
403. Pautrat, R., Marteau J., (Agence Natinale de valoristation de la Recherche (Anyar), Ger. Offen., 2,216,893; C.A. **78**, 5210^p (1973).
404. Naarmann, H., Kochler, G., Theophilou, N., Schue, F., Ger. Offen., DE 3,721,743; C.A. **110**, 193664^r (1989).
405. Albarella, J.P., Lin, N.H., (Miles Inc. USA) Eur. Pat. Appl., EP 389,904; C.A. **114**, 207015^b (1991).
406. Fisk, T.E., (Dow Chemical Co.) U.S. Patent, US 4,500,675; C.A. **102**, 204919^r (1985).
407. Schmidt, E., Clauss, K., Pietsch, H., Jenson, H., (Hoechst A.G.) Ger. Offen., 2,434,547; C.A. **84**, 164862^f (1976).
408. Wafilm, B.V., Neth. Appl., 7,500,489; C.A. **86**, 90942^m (1977).
409. Ciba Geigy A.G., Japan Kokai Tokkyo Koho, JP 59,179,897 [84,179,897]; C.A. **102**, 151151^a (1985).



THE CHEMISTRY OF

CHLOROSULFONYL ISOCYANATE

Numerous articles have been published on chlorosulfonyl isocyanate (CSI), but no book compiling research on this versatile reagent has been available up to now. This book fills that gap. It provides an overview of the research on CSI, including information about commercially exploitable patented products involving the use of CSI.

The book is divided into two parts. The first part outlines the reactions of CSI with a wide variety of substrates. The second part outlines the applications of CSI in the preparation of useful products. These applications are classified as: herbicides, pesticides, and insecticides; antiviral and anticancer compounds; biologically active compounds; antibiotics; and miscellaneous compounds.

The Chemistry of Chlorosulfonyl Isocyanate is an important book that should serve as a one-stop ready reference for researchers interested in the study of CSI.

www.worldscientific.com

5032 hc

ISBN 981-238-081-7



9 789812 380814