

RODD'S CHEMISTRY OF CARBON COMPOUNDS

A modern comprehensive treatise

SECOND EDITION

Edited by

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VOLUME IV PART H

HETEROCYCLIC COMPOUNDS

Six-membered heterocyclic compounds with (a) a nitrogen atom common to two or more fused rings; (b) one hetero-atom in each of two fused rings. Six-membered ring compounds with two hetero-atoms from Groups VI B, or V B and VI B of the Periodic Table, respectively. Isoquinoline, lupinane and quinolizidine alkaloids



ELSEVIER SCIENTIFIC PUBLISHING COMPANY

AMSTERDAM OXFORD NEW YORK

1978

ELSEVIER SCIENTIFIC PUBLISHING COMPANY
335 JAN VAN GALENSTRAAT
P.O. BOX 211, AMSTERDAM, THE NETHERLANDS

DISTRIBUTORS FOR THE U.S.A. AND CANADA

ELSEVIER NORTH-HOLLAND INC.
52 VANDERBILT AVENUE, NEW YORK, N.Y. 10017

WITH 47 TABLES

ISBN: 0-444-40664-6 (SERIES)
ISBN: 0-444-41575-0 (VOL. IVH)

LIBRARY OF CONGRESS CARD CATALOG NUMBER 64-4605

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ELSEVIER SCIENTIFIC PUBLISHING COMPANY,
P.O. BOX 330, AMSTERDAM

PRINTED IN THE NETHERLANDS

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RODD'S CHEMISTRY OF CARBON COMPOUNDS

VOLUME I
GENERAL INTRODUCTION
ALIPHATIC COMPOUNDS

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VOLUME II
ALICYCLIC COMPOUNDS

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VOLUME III
AROMATIC COMPOUNDS

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VOLUME IV
HETEROCYCLIC COMPOUNDS

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VOLUME V
MISCELLANEOUS
GENERAL INDEX

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PREFACE TO VOLUME IV H

The first four sub-volumes (Parts) of Volume IV of this revised edition of *Rodd's Chemistry of Carbon Compounds* are concerned with the chemistry of organic compounds possessing in their structure an isolated three-, four- or five-membered ring in which a single hetero-atom is present. Parts E, F and G deal with the chemistry of the wider and more varied types of compounds based on six-membered monoheterocyclic systems.

The first four chapters of the present sub-volume, IV H, are a continuation of this theme, the last two, however, are the opening chapters of the series dealing with the next major group of compounds, namely, those based on a six-membered heterocycle with two hetero-atoms in the ring.

Chapter 36, contributed by Dr. S. F. DYKE, is — although its length may appear to belie the statement — a concise account of the isoquinoline alkaloids comprising a very wide range of compounds of great interest from structural organic chemical and biochemical points of view. Chapter 37, by Professor NEIL CAMPBELL, is concerned with a further basic type of heterocyclic system to those already considered, in which a nitrogen atom is situated at the junction of a system of two or more fused-ring structures having the hetero-atom in common, or in which the hetero-atom forms the bridge in a bicyclic structure. The following chapter by Professor H. C. S. WOOD and Dr. R. WRIGGLESWORTH, describes the group of related natural products, the quinolizidine alkaloids. The systematic treatment of six-membered monoheterocyclic compounds containing a hetero-atom from Groups V or VI B, is concluded with Chapter 39 by Professor CAMPBELL in which he discusses fused-ring compounds containing two heterocyclic rings each possessing a single hetero-atom.

The last two chapters in this sub-volume, by Dr. MALCOLM SAINSBURY, are devoted, respectively, to the chemistry of six-membered heterocyclic compounds containing in the ring two hetero-atoms from Group VI B of the Periodic Table, *i.e.* oxygen, sulphur, selenium and tellurium, or one element from this Group along with nitrogen in Group V.

Our knowledge of the chemistry of each of the classes of compounds referred to above has greatly increased since the original edition of this book was published; the volume of literature the contributors have needed to take into consideration in preparing their scripts has been truly formidable. The editor takes this opportunity to congratulate them, on the completion of their tasks; on the way they have presented the results of their labours and to thank them for their help and cooperation in preparing the scripts for publication.

March 1978

S. COFFEY

Titles of other parts of Volume IV

HETEROCYCLIC COMPOUNDS

- Vol. IV A:* Three-, four- and five-membered heterocyclic compounds with a single hetero-atom in the ring
- Vol. IV B:* Five-membered heterocyclic compounds with a single hetero-atom in the ring: alkaloids, dyes and pigments
- Vol. IV C:* Five-membered heterocyclic compounds with two hetero-atoms in the ring from Groups V and/or VI of the Periodic Table
- Vol. IV D:* Five-membered heterocyclic compounds with more than two hetero-atoms in the ring
- Vol. IV E:* Six-membered monoheterocyclic compounds containing oxygen, sulphur, selenium, tellurium, silicon, germanium, tin, lead or iodine as the heteroatom
- Vol. IV F:* Six-membered heterocyclic compounds with a single nitrogen atom in the ring: pyridine, polymethylenepyridines, quinoline, isoquinoline and their derivatives
- Vol. IV G:* Six-membered heterocyclic compounds with a single nitrogen atom in the ring to which are fused two or more carbocyclic ring systems, and six-membered ring compounds where the hetero-atom is phosphorus, arsenic, antimony or bismuth. Alkaloids containing a six-membered heterocyclic ring system
- Vol. IV I:* Six-membered heterocyclic compounds with two hetero-atoms from Group V of the Periodic Table: the Pyridazine and Pyrimidine groups
- Vol. IV J:* Six-membered heterocyclic compounds with two hetero-atoms from Group V of the Periodic Table: the Pyrazine group, Phenoxazine, phenothiazine, phenazine and sulphur dyes. Six-membered heterocyclic compounds with three or more hetero-atoms
- Vol. IV K:* Six-membered heterocyclic compounds with two or more hetero-atoms one or more of which are from Groups other than V or VI of the Periodic Table. Heterocyclic compounds with seven-membered and larger rings

OFFICIAL PUBLICATIONS

B.P.	British (United Kingdom) Patent
F.P.	French Patent
G.P.	German Patent
Ger. Offen.	German Patent Application, open for inspection
Sw. P.	Swiss Patent
U.S.P.	United States Patent
U.S.S.R.P.	Russian Patent
B.I.O.S.	British Intelligence Objectives Sub-Committee Reports, H.M. Stationery Office, London.
C.I.O.S.	Combined Intelligence Objectives Sub-Committee Reports
F.I.A.T.	Field Information Agency, Technical Reports of U.S. Group Control Council for Germany
B.S.	British Standards Specification
A.S.T.M.	American Society for Testing and Materials
A.P.I.	American Petroleum Institute Projects
C.I.	Colour Index Number of Dyestuffs and Pigments

SCIENTIFIC JOURNALS AND PERIODICALS

With few obvious and self-explanatory modifications the abbreviations used in references to journal and periodicals comprising the extensive literature on organic chemistry, are those used in the World List of Scientific Periodicals.

LIST OF ABBREVIATED NAMES OF CHEMICAL FIRMS MENTIONED IN PATENT REFERENCES

A.G.F.A., Agfa A.G.	Aktiengesellschaft für Anilinfabrikation (Berlin)
B.A.S.F.	Badische Anilin- und Soda-Fabrik (Ludwigshafen)
Bayer	Farbenfabriken vorm. Friedrich Bayer und Co. (Leverkusen)
Cassella	Leopold Cassella und Co. (Frankfurt am Main)
C.F.M.	Compagnie française des Matières Colorantes (Paris)
CIBA	Gesellschaft für chemische Industrie (Basel)
Du Pont	E.I. Du Pont de Nemours and Co. (U.S.A.)
G.A.F.	General Anilin and Film Corporation (U.S.A.)
Geigy A.G.	J. R. Geigy S.A. (Basel)
Hoechst	Hoechst A.G. (see M.L.B.)
I.C.I.	Imperial Chemical Industries, Ltd. (London)
I.G.	(= Interessen Gemeinschaft Farbenindustrie) of the principal dyestuffs manufacturers in Germany
Kalle	Kalle und Co., A.G. (Biebrich am Rhein)
M.L.B.	Farbwerke vormals Meister, Lucius und Brüning (Hoechst)
Sandoz	Sandoz A.G. Chemische Fabrik (Basel)

LIST OF COMMON ABBREVIATIONS AND SYMBOLS USED

A	acid
Å	Ångström units
Ac	acetyl
<i>a</i>	axial
<i>as, asymm.</i>	asymmetrical
at.	atmosphere
B	base
Bu	butyl
b.p.	boiling point
C, mC and μ C	curie, millicurie and microcurie
<i>c, C</i>	concentration
c.d.	circular dichroism
conc.	concentrated
crit.	critical
D	Debye unit, 1×10^{-18} e.s.u.
<i>D</i>	dissociation energy
D	dextro-rotatory; dextro configuration
DL	optically inactive (externally compensated)
<i>d</i>	density
dec. or decomp.	with decomposition
deriv.	derivative
<i>E</i>	energy; extinction; electromeric effect
E1, E2	uni- and bi-molecular elimination mechanisms
E1cB	unimolecular elimination in conjugate base
e.s.r.	electron spin resonance
Et	ethyl
<i>e</i>	nuclear charge; equatorial
<i>f</i>	oscillator strength
f.p.	freezing point
<i>G</i>	free energy
g.l.c.	gas liquid chromatography
<i>g</i>	spectroscopic splitting factor, 2.0023
<i>H</i>	applied magnetic field; heat content
<i>h</i>	Planck's constant
Hz	hertz
<i>I</i>	spin quantum number; intensity; inductive effect
i.r.	infrared
<i>J</i>	coupling constant in n.m.r. spectra
<i>K</i>	dissociation constant
<i>k</i>	Boltzmann constant; velocity constant
kcal.	kilocalories
L	laevorotatory; laevo configuration
<i>M</i>	molecular weight; molar; mesomeric effect
Me	methyl

<i>m</i>	mass; mole; molecule; <i>meta</i> -
ml	millilitre
m.p.	melting point
Ms	mesyl (methanesulphonyl)
[M]	molecular rotation
<i>N</i>	Avogadro number; normal
n.m.r.	nuclear magnetic resonance
N.O.E.	Nuclear Overhauser Effect
<i>n</i>	normal; refractive index; principal quantum number
<i>o</i>	<i>ortho</i> -
o.r.d.	optical rotatory dispersion
<i>P</i>	polarisation; probability; orbital state
Pr	propyl
Ph	phenyl
<i>p</i>	<i>para</i> -; orbital
p.m.r.	proton magnetic resonance
<i>R</i>	clockwise configuration
<i>S</i>	counterclockwise config.; entropy; net spin of incompleted electronic shells; orbital state
S _N 1, S _N 2	uni- and bi-molecular nucleophilic substitution mechanisms
S _N i	internal nucleophilic substitution mechanisms
<i>s</i>	symmetrical; orbital
<i>sec</i>	secondary
soln.	solution
symm.	symmetrical
<i>T</i>	absolute temperature
Tosyl	<i>p</i> -toluenesulphonyl
Trityl	triphenylmethyl
<i>t</i>	time
temp.	temperature (in degrees centigrade)
<i>tert</i>	tertiary
<i>U</i>	potential energy
u.v.	ultraviolet
<i>v</i>	velocity
α	optical rotation (in water unless otherwise stated)
[α]	specific optical rotation
α_A	atomic susceptibility
α_E	electronic susceptibility
ϵ	dielectric constant; extinction coefficient
μ	microns (10^{-4} cm); dipole moment; magnetic moment
μ_B	Bohr magneton
μg	microgram (10^{-6} g)
λ	wavelength
ν	frequency; wave number
χ , χ_a , χ_μ	magnetic, diamagnetic and paramagnetic susceptibilities

XX

LIST OF COMMON ABBREVIATIONS

~
(+)
(-)
⊖
⊕

about
dextrorotatory
laevorotatory
negative charge
positive charge

CONTENTS

VOLUME IV H

Heterocyclic Compounds: Six-membered heterocyclic compounds with (a) a nitrogen atom common to two or more fused rings; (b) one hetero-atom in each of two fused rings. Six-membered ring compounds with two hetero-atoms from Groups VI B, or V B and VI B of the Periodic Table, respectively. Isoquinoline, lupinane and quinolizidine alkaloids.

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