

# Reactivity and Structure Concepts in Organic Chemistry

Volume 9

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# Metal Vapour Synthesis in Organometallic Chemistry

With 36 Figures and 32 Tables



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*For Hilary and La Tendre Poulet*

# Preface

Metal Vapour Synthesis (MVS) can be defined as; "The use in synthesis of high temperature gaseous species such as metal atoms by their reactions with themselves or other materials in a condensed phase." This short book, covering the literature up to the middle of 1979, describes MVS in organic chemistry; i.e. the reactions of metal atoms with various, predominantly organic, substrates in the synthesis and reactivity studies of organic and organometallic compounds. In order to effectively describe all the underlying principles and to present a cohesive picture of pertinent metal atom processes in condensed organic phases, some inorganic substrates such as rare gases, dinitrogen, dioxygen, dihalogens, and inorganic halides have been included. For similar reasons, we have used, where relevant, information provided by the closely related technique of Matrix Isolation Spectroscopy (MIS).

After an introductory chapter which gives the basis principles and includes a brief critique of the technique, the book is divided into three further chapters dealing respectively with

- (a) experimental techniques,
- (b) behaviour of metal atoms in matrices, and
- (c) results of preparative experiments.

While not being encyclopaedic the book describes or refers to all noteworthy areas if not in the deliberately short text in the many tables and figures. Therefore we hope that chemists, fresh or experienced, will find this book useful as a comprehensive introduction to the technique, a starting point for the setting up of MVS equipment, a guide to the metal atom processes, and a synopsis of metal atom reactions to date.

On the present evidence we can see a considerable future for MVS both in the research laboratory and in the commercial production of catalysis and related metal coated systems.

J. R. Blackborow  
D. Young

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# Abbreviations

Ac	acetyl	Hal	halogen
acac	acetylacetonate	Hex	hexyl
acacH	acetylacetonone	I.P.	ionisation potential
An	acrylonitrile	ir	infrared (spectroscopy)
Bd	buta-1,3-diene	L	2-electron ligand
bipy	dipyridyl	Me	methyl
bp	boiling point	Mht	methylheptatriene
Bu	Butyl	MIS	matrix isolation spectroscopy
Bu <sup>n</sup>	n-butyl	M.O.	molecular orbital
Bu <sup>i</sup>	iso-butyl	mp	melting point
Bu <sup>s</sup>	sec-butyl	MVS	metal vapour synthesis
Bu <sup>t</sup>	tert-butyl	Nbd	norbornadiene
c	cis	Nbe	norbornene
Cdt	cyclododeca-1,5,9-triene	nmr	nuclear magnetic resonance
Cht	cycloheptatrienyl	Ot	octatriene
ChtH	cycloheptatriene	Pbd	polybutadiene
ChtH <sub>2</sub>	cycloheptadienyl	pes	photoelectron spectroscopy
ChtH <sub>3</sub>	cycloheptadiene	Ph	phenyl
Cod	cyclooctadiene	PhH	benzene
Cot	cyclooctatetraene	PhMe	toluene
Cp	cyclopentadienyl	Pr	propyl
CpH	cyclopentadiene	Pr <sup>n</sup>	n-propyl
Cy	cyclohexyl	Pr <sup>i</sup>	iso-propyl
CyH	cyclohexane	py	pyridine
Db	dibenzylideneacetone	t	trans
Ddt	dodecateraene	TCNQ	tetracyanoquinodimethane
dec	decomposition	thf	tetrahydrofuran
diphos	1,2-bis(diphenylphosphino)ethane	uv	ultraviolet (spectroscopy)
e	electron	uv-vis	ultraviolet-visible (spectroscopy)
esr	electron spin resonance	X	1-electron ligand
Et	ethyl	xs	excess
glc	gas liquid chromatography	Δ	heat, warm

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