ELSEVIER

Journal of Organometallic Chemistry 540 (1997) 193–196

Journal of Organometallic Chemistry

Book reviews

The Chemistry of Transition Metal Carbides and Nitrides, S.T. Okama (ed.), Chapman & Hall, London, 1996, 536 + xxv pages, £125, ISBN 0 7514 0365 2

Many organometallic chemists have now been lured into the wide-ranging world of materials chemistry, both because of its undoubted fascination and applicability and because it often offers an increased likelihood of funding. These chemists then require extended insight into the structures, properties and actual or potential applications of the materials they seek to produce, and this provides the justification for reviewing the present volume in a journal devoted to organometallic chemistry.

This book cannot be fairly described as a comprehensive overview of its subject area; indeed the amount of published work is such that no single volume could achieve this. It is better considered as a set of vignettes which highlight particular aspects of current research in the area, and derives from a symposium which formed part of the Congress of Pacific Rim Chemical Societies, held in Honolulu in December 1995. Topics include studies of the crystal and electronic structures of these compounds, their physical and chemical properties, improved preparative methods, calculations concerned with bonding modes, Fermi levels and superconductivity, their uses as catalysts, cutting tools and magnetic materials, and even their possible use in nuclear rocket motors for space travel. One feature which emerges is that although an immense amount of detailed and precise information about these materials has been uncovered, there is still uncertainty regarding some of the most fundamental physical and mechanical properties, probably because of the difficulty of obtaining really pure bulk materials. Thus the melting point of TiC is variously quoted in Chapters 1 and 2 as 2903 and 3370 K, its microhardness as 3200 and 3000 $kg\,mm^{-2}$, and its Young's modulus as 370 and 451 GPa.

The chapter of most direct interest to organometallic chemists is that dealing with single-substance precursors for the chemical vapour deposition (CVD) of films of TiN, TiC, VN and VC and contributed by well-known practitioners from the Toulouse and Perpignan groups. These compounds are not only refractory ceramics, useful as protective coatings, but also have applications in microelectronics: thus thin films of TiN are important as a barrier layer to prevent mutual and harmful diffusion between silicon substrates and attached metal conductors. A critical examination of the behaviour of 28 volatile organometallic precursors under low-or atmospheric-pressure CVD conditions, together with detailed analysis of the solid and gaseous products, provides important insights into the requirements for useful precursor design. Compounds such as $(\eta^5\text{-}C_5H_5)_2TiCl$ and $[\eta^5\text{-}C_5H_3(SiMe_3)_2]TiCl_3$ (for TiC) or $(\eta^5\text{-}C_5H_4Bu^t)_2V$ (for VC) seem particularly promising. Single-compound precursors for nitrides are more elusive, and often lead to unwanted carbon and/or halogen incorporation (e.g. $(\eta^5\text{-}C_5H_5)TiCl_2[N(SiMe_3)_2]$ and Cl_3VNBu^t).

This well-produced and up-to-date book makes extensive reference to the primary literature, although patents on industrial applications are sparse. It represents a useful resource for chemists wishing to expand their horizons.

B.J. Aylett
Chemistry Department
Queen Mary and Westfield College
University of London
London E1 4NS
UK

PII S0022-328X(96)06935-5

Gmelin Handbook of Inorganic and Organometallic Chemistry, 8th edn., Organolead Compounds Part 4: R_3PbR' compounds, edited by W. Petz, Springer-Verlag, Berlin, 1995, 409 pp. + xiv, DM 2,350.00, ISBN 3-540-93727-7

Parts 1–3 of this series on organolead compounds dealt with compounds of the type PbR_4. This new edition, written by F. Huber, is concerned with compounds of the type R_3PR', which provide most of the known unsymmetrical compounds with more than one type of organic group attached to lead. Many of the compounds R_3PbR' were prepared for studies of their possible application as anti-knock additives to

Published by Elsevier Science S.A.