

investigations and considerations on the structures, formation mechanisms, stability and acid–base properties of the polymeric species.

One cannot help but be filled with admiration for this work. If the Gmelin Handbook has a detectable weakness in its structure, it is that it tends to concentrate on individual compounds and sometimes loses the more general picture. This volume is a model of how such pitfalls can be avoided. The volume is the usual professional product which one expects for this series, and it is without peer, both as a source of factual data and as a definitive text upon an extremely complex area of chemistry. This book must be purchased by all academic and industrial research libraries: it is expensive, but is also invaluable.

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Gmelin handbook of inorganic chemistry, 8th edition, *W—Tungsten, Supplement Volume A7: Metal, Chemical Reactions with Inorganic and Organic Compounds*, Springer-Verlag, Berlin, Heidelberg, New York, Tokyo, 1987, xxv + 410 pages, DM 1771. ISBN 3-540-93541-X.

This is the eighth volume of the Gmelin Handbook to describe the chemistry of tungsten (System No. 54) since the main volume was published in 1933. Of these, six have dealt (five exclusively) with tungsten oxide species, and none have yet considered the very important areas of the coordination and organometallic chemistry of tungsten. The current supplement volume (A7) describes the chemical reactions of metallic tungsten with both inorganic and organic compounds (reactions with metallic elements will be described in A6, and reactions with non-metallic elements will be described in A5). It should be noted, however, that this volume specifically excludes all reactions which result in the formation of organotungsten compounds. Thus, although one might have expected to find an important section upon metal vapour synthesis, this has been deferred until the long-awaited volume(s) upon the organometallic chemistry of tungsten appear. A majority of this volume is, perhaps not surprisingly, concerned with chemistry at the the surface of tungsten rather than the reactions of bulk tungsten, and is thus both topical and timely.

The first section (of five) in this volume deals, in 220 pages, with the reactions of tungsten with non-metal compounds (including water, H_2O_2 , N_2H_4 , NH_3 , nitrogen oxides, Group 17 derivatives (especially HX), sulfur compounds, H_2Se , boron compounds, carbon monoxide (91 pages; > 500 refs.), carbon dioxide, HCN, halocarbon derivatives, and a wide range of silicon, phosphorus and arsenic derivatives). The following section (80 pages) describes the reactions of tungsten with metal compounds (including Group 1 hydroxides, nitrates, nitrites, halides, oxides, and oxoanion salts, Group 2 oxides, nitrides, halides and carbonates, Group 12 compounds, Al_2O_3 , gallium compounds, lanthanide oxides and borides, and many binary compounds of the *d*- and *f*-block transition metals). The third section (20 pages) describes the reaction of tungsten with aqueous acids, alkalis and salts, whereas the fourth section (7 pages) deals with the reactions of tungsten with a range of miscellaneous inorganic reagents of industrial interest (including combus-

tion gases, town and natural gas, sea water, etchants, pickling solutions, solid oxidant mixtures, ceramics, glass melts, rock melts and magmatic melts). The final section (75 pages) is concerned with the reactions of tungsten with organic compounds (including alkanes, alkenes, alkynes, arenes, di-*t*-butylperoxide, alcohols, aldehydes, ketones, carboxylic acids, esters, ethers, organo-nitrogen, organo-halogen and organo-sulfur derivatives, and natural rubber and phenolic resins). The only reactions between tungsten and organometallic compounds described are with diarylmercury(II) and with tetramethyllead(IV).

The authors (E. Best, P. Kuhn, W. Kurtz and H. List) have produced an outstanding literature survey (up to the end of 1985), which is well constructed for easy access of information. Although the volume is principally concerned with the surface chemistry of tungsten, this should be of interest to all organometallic chemists, particularly to those concerned with catalysis. It meets the high standards which one expects from this series, and should form a part of any chemistry library collection.

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