

Book review

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"Gmelin Handbook of Inorganic Chemistry", 8th Edition, Main Series, System No. 14, Carbon, Part D4, "Carbon-Sulfur Compounds", D. Koschel, chief editor, 1977, xviii + 271 pages, DM 595, \$261.80. New Supplement Series, Vol. 32, "Sulfur-Nitrogen Compounds. Part 1. Compounds with Sulfur in Oxidation Number VI", E. Fluck and W. Haubold, volume authors, M. Becke and H. Bitterer, volume editors, 1977, xii + 268 pages, DM 531, \$233.70. Main Series, System No. 56, Manganese, Part C6, "Compounds with Sulfur, Selenium and Tellurium, H. Katscher, chief editor, 1976, xxxii + 360 pages, DM 765, \$313.70, Gmelin Institut für Anorganische Chemie und Grenzgebiete der Max-Planck-Gesellschaft zur Förderung der Wissenschaften, Springer-Verlag, Berlin/Heidelberg/New York.

Sulfur is the protagonist in these three new Gmelin handbook volumes which cover compounds of this important element with carbon, with nitrogen and with manganese. The first two will be of tangential interest to organometallic chemists.

The volume on carbon-sulfur compounds deals with some real nasty customers and includes in its contents discussions of  $C_3S_2$ ,  $CS$ ,  $CS^+$ ,  $CS^-$ ,  $CS_2$ ,  $CS_2^+$ ,  $CS_2^{2+}$ ,  $CS_2^{3+}$ ,  $CS_2^-$ , thiocarbonic acids and thiocarbonates, and substituted thiocarbonic acids and thiocarbonates. The sulfur analog of carbon suboxide is a red liquid and a lachrymator with penetrating odor, yet a good bit is known about it in the way of spectroscopic and physical properties. Much more is known about the unstable  $CS$  and its monpositive and mononegative ions, but aside from the matrix reaction of  $CS$  with nickel atoms at  $10^\circ K$ , nothing is indicated about transition metal- $CS$  complexes, which are of considerable current interest. The bulk of this book (170 pages) deals with carbon disulfide, which is of some industrial importance in spite of its unpleasant properties. Its flammability, its tendency to form explosive mixtures with air and its high toxicity are stressed at the outset. Carbon disulfide is a well studied molecule indeed, and the results of all of the many physical, spectro-

scopic and chemical studies which have dealt with it in one way or another are cited here. Trithiocarbonic acid is more unpleasant: when it decomposes it gives carbon disulfide and hydrogen sulfide. Its triethylammonium salt is prepared by the reaction of carbon disulfide and liquid hydrogen sulfide, which also serves as the reaction medium, in the presence of triethylamine. Heroic chemistry, indeed! The book concludes with coverage of xanthates, which have received much study.

The volume on sulfur-nitrogen compounds inaugurates another mini-series within the Gmelin New Supplement framework. Sulfur-nitrogen chemistry has been an active active field of inorganic chemistry during the last twenty years, and with the recent advent of poly(sulfur nitride),  $(SN)_x$ , which has such intriguing electrical properties, we can expect even greater activity in this area. The present volume, Part 1 of the mini-series, covers SN compounds of diverse types in which sulfur has the oxidation number VI. It begins with cyclic compounds, of which hexasulfimide,  $(HNSO_2)_6$ , is the first to be listed. Further organization of noncyclic SN compounds is based on the S:N atom ratio in the compound, with separate chapters devoted to those in which the S:N ratio is  $>1$ , 1:1, 2:3, 1:2, 1:3 and 1:4. The last three chapters are devoted to SN compounds based on hydrogen azide, hydrazine and hydroxylamine, respectively. The diversity of the many compounds is so great that it is impossible to do them justice. One can only compliment the organizational work of the authors. This book would be very difficult to use without an index, and two useful indexes are provided: a well-conceived formula index and a ring index, whose organization is clearly explained, in English as well as in German.

Finally, the manganese-sulfur/selenium/tellurium volume is much more straightforward. As might be expected, manganese compounds containing sulfur take up most of the book (268 pages out of 360), with most of these being manganese sulfides ( $MnS$ ,  $MnS_2$ , etc.) and manganese(II) sulfates, simple (e.g.,  $MnSO_4$  itself) and mixed (e.g.,  $Al_4Mn_2(SO_4)_9$ ). Similar types of compounds of manganese and selenium and tellurium are covered in the latter part of the book. There is not much for the organometallic chemist here, but this is basic inorganic chemistry, whose collection in one place is a vital contribution to the literature resources of inorganic chemistry. The coverage is complete: everything known about a given compound.

is there. Consider the information given on MnS: 34 pages with details on preparation, crystallographic properties, mechanical and thermal properties, electrical and optical properties, electrochemical behavior, chemical reactions and solubility, with all pertinent literature citations.

As is usually the case with Gmelin volumes, all three of these books are quite up-to-date, with literature coverage through the end of 1975. In the sulfur-nitrogen volume the citations of general literature references - handbooks, monographs and reviews - are very useful for the reader who wishes to orient himself in this field, and in the manganese-sulfur/selenium/tellurium volume each major section is introduced with a brief but useful overview presented both in German and in English. English translations of the preface, table of contents, chapter and section headings are provided in each of these books.

These three books are valuable additions to the Gmelin handbook series which provides such a useful literature resource for the inorganic chemist, as well as for chemists active in other fields.

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