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## Phosphorus, Sulfur, and Silicon and the Related Elements

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**A review of: "The Chemistry of Organic Selenium and Tellurium Compounds, Vol. 1, Saul Patai and Zvi Rappoport, eds., John Wiley and Sons, New York. 1986. XIV + 939 pp., \$271.00."**

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## BOOK REVIEW

*The Chemistry of Organic Selenium and Tellurium Compounds, Vol. 1*, Saul Patai and Zvi Rappoport, eds., John Wiley and Sons, New York. 1986. XIV + 939 pp., \$271.00.

This volume is the most recent addition to the series being published as "The Chemistry of Functional Groups". The fact that this large volume is only the first of two which deals with the organic chemistry of selenium and tellurium reflects the greatly increased research effort which has been given to these two elements during the past fifteen years. The authors and the editors are to be congratulated for their efficiency in getting the volume published so soon after the receipt of the manuscripts. This is reflected in the large number of recent references which appear at the conclusions of most of the chapters.

The first chapter gives the reader a brief overview of the subject in which individual topics such as nomenclature, history and analogies with the other Group VI elements are presented. In the reference section the reader is informed about more detailed coverages of these subjects. R. A. Poirier and I. C. Csizmadia, in Chapter 2, discuss the theoretical aspects of selenium- or tellurium-containing organic compounds. The authors guide the reader through the fundamentals of molecular orbital theory reminding him of the use and appearance of Slater- and Gaussian-type orbitals. Only a few Gaussian-type basis sets have been used for Se and Te and these are all tabulated. This chapter presents the most recent results thus far calculated with an appropriate discussion of the shortcomings. In Chapter 3 a very well-organized and thorough presentation of the structural chemistry of this group of compounds is given. I. Hargittai and B. Rozsondai organize this presentation according to coordination numbers. This is a logical and useful approach. The next several chapters deal with thermochemistry, analysis, nmr and mass spectrometry. The analytical presentation, by K. J. Irgolic and D. Chakraborty is especially useful because it arranges analytical methods according to group functionality. This presentation will be useful to those interested in the environmental chemistry of selenium because of the importance attached to the speciation of compounds. N. P. Luthra and J. D. Odom discuss the nmr properties of  $^{77}\text{Se}$ ,  $^{123}\text{Te}$  and  $^{125}\text{Te}$ . They discuss the difficulties involved in the selection of a suitable standard for measuring  $^{77}\text{Se}$  chemical shifts. The chemical shifts themselves are discussed according to classes of compounds. The chapter on mass spectrometry points out the uncertainties which exist in the mass spectral dissociation mechanisms proposed for Se and Te compounds. R. Badiello ably covers the subject of the radiation chemistry of Se- and Te-containing compounds and discusses the possible role of Se-containing compounds as radioprotective agents.

The next four chapters are concerned with Se-stabilized carbenium ions and radicals, Se- and Te-containing polymers, compounds in which Se and Te form bonds to Group IIIa, IVa, and Va elements and the synthesis and uses of

isotopically labelled Se and Te compounds. Of particular interest are the 1,3-dichalcogenolylum ions because of the recent surge of interest in "organic metals". The observation of highly conductive properties of modified polyarylene sulfides has created a considerable interest in the synthesis of organoselenium and to a lesser extent, organotellurium polymers. This is an area which invites initiative and imagination. Compounds in which selenium or tellurium atoms are bonded to elements of Groups IIIa, IVa, and Va are relatively few in number, but their photochemical and thermochemical instabilities could possibly be put to practical use.  $^{75}\text{Se}$ -selenomethionine is used clinically as a pancreas-imaging agent and  $^{123\text{m}}\text{Te}$  labelled fatty acids may be useful as myocardial-imaging agents.  $^{123\text{m}}\text{Te}$ - and  $^{75}\text{Se}$ -labelled compounds have also been utilized in the study of fat absorption and as brain-imaging agents, respectively. Chapter 13, by Prof. M. Renson, of the University of Liege, reflects the expertise of the author. The coverage is extremely thorough and up-to-date. Heterocyclic selenium and tellurium systems have found an important place as sensitizing dyes in photographic films. Prof. Renson's chapter refers to almost 1100 citations and is devoted largely to the most recent literature. The important contributions of the Swedish school, pioneered by A. Fredga, have been continued by J. Bergman and his student, L. Engman. Together with J. Sidén, they have put together an excellent chapter on tetra- and hypervalent derivatives. Italian chemists at the University of Perugia developed high yield syntheses of tellurophene about 15 years ago. F. Fringuelli and A. Taticchi of that school have put together a detailed presentation in Chapter 15, on the directing and activating effects involving selenium and tellurium. Chapter 16, by N. Sonoda and A. Owaga of Osaka University, focuses on the syntheses and reactions of selenols, selenenic acids, seleninic acids, selenonic acids and their derivatives and tellurium analogues. In selenonium and telluronium salts, as well as in selenoxides, the Se or Te atom may function as a chiral center. In diselenides or ditellurides, they are part of an axis of chirality. G. Snatzke presents a competent review of the stereochemical and chiroptical properties of organoselenium and tellurium compounds in Chapter 17.

Chapter 18, 176 pages in length, reflects the great interest which exists in the chemistry of coordination compounds. This chapter, by Henry J. Gysling, is entitled "Ligand Properties of Organic Selenium and Tellurium Compounds." Gysling points out the application potential of selenium-containing ligands. Examples of "electrodeless plating" are the deposition of photoconducting thin films of  $\text{PbSe}$ ,  $\text{Sb}_2\text{Se}_3$ ,  $\text{TlSe}$  and  $\text{CdSe}$ .  $\text{Ag(I)}$  and  $\text{Cu(I)}$  complexes with organo-tellurium ligands can be used in thermally processed imaging elements.  $\text{PtCl}_2(\text{SePh}_2)_2/\text{SnCl}_2$  has been reported to function as a homogeneous catalyst for the hydrogenation of non-aromatic olefins.

This volume is timely, thorough, and up-to-date. The reader will find between these covers a wealth of information and a rich source of references. The cost of the book will very likely restrict it largely to library collections, but it will be invaluable to anyone who works with these elements.

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