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Book review

Gmelin Handbook of Inorganic Chemistry, 8th edition, Pd—Palladium. Supplement Volume B2: Palladium Compounds, Springer-Verlag, Berlin, 1989, xvi + 354 pages, DM 1619.00. ISBN 3-540-93586-X.

Palladium is an immensely important element, commercially, catalytically, academically and industrially. It is absolutely remarkable, given its tremendous importance, that this is the first volume of Gmelin devoted to palladium (System No. 65) to be published since 1942. This volume concentrates on the simple binary compounds of palladium, and the coordination compounds derived from them, and is long overdue. It is to be hoped that volumes upon the coordination complexes and organometallic compounds of palladium are in the pipeline, but if molybdenum and tungsten are anything to go by, there may be another fifty-year wait until these much needed volumes appear.

However, this volume is a delight. It is extremely well written and organized, and deals with a vast range of chemistry. The authors are to be congratulated, in particular, for their careful inclusion of a wide range of spectroscopic properties. There are fifteen chapters, and all are worth some consideration.

The volume opens with the palladium–oxygen system (39 pages), and considers PdO, PdO_2, and PdO_3, followed by many ternary and quaternary systems, as well as hydroxopalladates, dioxygen complexes, aqua complexes and the adsorption of O_2 on palladium surfaces. The second chapter (Pd–N; 4 pages) briefly describes the nitrides and nitrates of palladium, whereas the third chapter (Pd–F; 22 pages) considers PdF, PdF_2, PdF_3, PdF_4, PdF_5, PdF_6, and a wide range of fluoropalladate salts.

The biggest chapter (110 pages), by far, describes the palladium–chlorine system, considering at length $PdCl_2$ (and its reactions and uses in organic synthesis), and the wide range of chloropalladate complexes, especially $[PdCl_4]^{2-}$, $[PdCl_6]^{2-}$, and $[Pd_2Cl_6]^{2-}$. The chapter concludes with consideration of the hydridochloro, aquachloro, and hydroxochloro complexes of palladium.

The chapters upon the palladium–bromine and palladium–iodine systems follow a similar outline to the chloride system, but are significantly shorter (29 pages and 12 pages, respectively), reflecting the lower level of interest in these systems. These chapters are followed by Pd–S (23 pages; including sulfides, sulfito complexes, sulfates, sulfato and thiosulfato complexes, and halosulfonato complexes), Pd–Se (8 pages; including binary, ternary and quaternary selenides), Pd–Te (8 pages; including binary and ternary tellurides), and Pd–B (6 pages; including borides and borane complexes of palladium).

The next chapter is more substantial (50 pages), and deals with palladium–carbon compounds. These include, due to the vagaries of the Gmelin system, binary carbides, as well as palladium cyanides and cyano complexes (e.g. $Pd(CN)_2$,

$[Pd(CN)_4]^{2-}$ and $[Pd(CN)_6]^{2-}$), and palladium thiocyanates and thiocyanato complexes (e.g. $Pd(SCN)_2$ and $[Pd(SCN)_4]^{2-}$). The Pd–Si chapter is predictably shorter, dealing only with silicides (11 pages). The final three chapters deal with Pd–P, Pd–As and Pd–Sb, but their contents are rather unpredictable. Thus the palladium–phosphorus chapter (20 pages) contains, along with the expected details of binary and polynary phosphides, phosphates, phosphato complexes and pyrophosphato complexes, the more surprising complexes containing thiocyanato and phosphine ligands. It is difficult to see the logic in including $[Pd(NCS)_2(PEt_3)_2]$ in this volume, but not $[PdCl_2(PEt_3)_2]$, but the Gmelin classification system remains one the great unsolved mysteries of life. Similar anomalies are found in the Pd–As and Pd–Sb chapters.

Overall, this is a remarkably useful book to both organometallic and coordination chemists. It should be in all chemistry libraries, and on the shelves of the major research groups. It is Gmelin at its best, and I wholeheartedly recommend it.

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