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Book review

Advances in Inorganic Chemistry and Radiochemistry, Vol. 20; edited by H.J. Emeléus and A.G. Sharpe, Academic Press, New York/San Francisco/London, 1977, vii + 374 pages, $38.00.

This latest volume in the series continues in large part the fine example set by its predecessors. This reviewer is inclined to question again, however, whether the title should continue to include "Radiochemistry" since with the possible exception of articles on technetium and protactinium in Vols. 11 and 12, no articles dealing with radiochemical topics have appeared since Vol. 5.

The present volume contains four reviews covering (in order) the chemistry of divalent and tetravalent lanthanide elements (D.A. Johnson), ferrimagnetic fluoride complexes (A. Tressaud and J.M. Dance), hydride complexes of ruthenium, rhodium and iridium (G.L. Geoffroy and J.R. Lehman) and the structures and physical properties of polynuclear carboxylate complexes (J. Catterick and P. Thornton). One general criticism of the volume is its long gestation period. All the reviews appear to end their literature coverage with 1974 although except for the third review they do include small selections of more recent work in appendices.

The review on lanthanide chemistry is the most extensive as well as the best contribution. It concentrates primarily on compounds of di-*f* and tetra-*f* metals, i.e., those in which the metal from magnetic and/or spectroscopic criteria has the same *f*-electron configuration as the free M^{2+} or M^{4+} ion. The two major sections review the chemistry of these respective oxidation states (with the exception of europium(III) and cerium(IV)) and a significant and quite thorough effort is made to develop patterns of stability of the di-*f* and tetra-*f* systems with respect to the common tri-*f* state. Further sections provide interpretations of these patterns via thermodynamic arguments and successfully test them on problems of redox stability in the actinide and first transition series.

The second review begins with a brief introduction to the treatment of magnetic exchange in insulators. Then follows a large section on the structural and magnetic properties of fully fluorinated complexes containing both one and two kinds of transition metal ions. Much of the data is presented in tabular form. The authors are to be commended for providing clear structural diagrams for many of the rather complex structural types encountered. The review covers the literature mainly in the period 1960—1974.

The third review is the weakest of the four although the extensive tables provide a useful index of hydride complexes of Ru, Rh and Ir together with selected properties such as τ(M—H), ν(M—H) and ν(CO). The literature coverage is mainly for the period 1968—1974. While an updated review of this very active area is certainly welcome, it is unfortunate that it could not have been published sooner. Short sections describe general preparative methods, chemical and physical properties, and methods of characterization. These are very elementary and of use only to a reader not already familiar with the field. Following these are short descriptions of various complexes of representative stoichiometries for each element with complete listings of only the new complexes reported during the period of the review. A misleading and very annoying symbolism is used in the section headings; no differentiation is made between monodentate and polydentate ligands. Thus both $[HRu_3(CO)_{12}]^+$ and $[HRu_3(CO)_9(C_{13}H_9)]$ are classified as $[HRu_3L_{12}]$. With the latter compound the verbal attempt to describe the structure is confusing. A drawing would have been preferable. Another bad example of this symbolism is the use of $[HRh_3L_{12}]$ to represent $[HRh_3(C_5H_5)_4]$. One rather significant omission is $[HRu(CH_2CH_3)PCH_2CH_2P(CH_3)_2(dmpe)]_2$ (F.A. Cotton, B.A. Frenz and D.L. Hunter, J. Chem. Soc. Chem. Commun., (1974) 755 (!!)). This is surprising since the precursor is described in the text (p. 203—204) (an error also appears in eq.24). Poor proofreading is also evident in the references where numerous misspellings occur e.g., Sheldrick (91), Yagupsky (100, 334—337), Rauchfuss (260). Finally, in VI-A-2 the hydride in $HRh(PPh_3)_4$ is said to bridge one face of the (phosphorus atom) tetrahedron. The original report suggests the hydride is "more or less in the tetrahedral face" but it certainly isn't bridging.

The final chapter discusses polynuclear carboxylate complexes containing at least one bridging carboxylate ligand. The majority of the discussion involves copper complexes and considerable magnetic and EPR data are provided in tables. In addition to the results of X-ray structure work, the use of electronic, vibrational, NMR, and Mössbauer spectroscopy in elucidating structure is discussed.

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