Book Reviews

Works intended for notice in this column should be sent direct to the Book-Review Editor (J. H. Robertson, School of Chemistry, University of Leeds, Leeds LS2 9JT, England). As far as practicable books will be reviewed in a country different from that of publication.

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Biological mineralization and demineralization. Edited by G. H. NANCOLLAS. Pp. viii + 415. Berlin, Heidelberg, New York: Springer-Verlag, 1982. Price DM 52.00, US $23.10.

This book is the report of the six-day Workshop conducted on this subject, in Berlin, in October 1981. It consists of about 15 independent 20-page background papers, plus four group-discussion reports of similar length. The first three rather basic, general papers are particularly useful to the non-specialist reader: *The Solubility Concept*, by Nancollas; *Nucleation*, by Garside; and *The Mechanisms of Crystal Growth and Dissolution*, by Nielsen and Christoffersen. Other papers are more specialized, and the coverage includes physicochemical studies and detailed accounts of phenomena ranging widely over the plant and animal kingdoms, from unicellular systems to those of shell, bone and teeth. The production is unattractive but the book is certainly informative and is well referenced and indexed.

Considerable progress has been made in bioinorganic chemistry over the past ten years or so, by the application of the knowledge and techniques of the exact sciences of physics and chemistry to those problems of biological chemistry where inorganic ions are involved. Progress is, however, very difficult, owing to the chemical complexity of biological systems, and the fine scale of the processes within them. The biologically controlled deposition of mineral materials by living organisms is simply one of these difficult but challenging areas.

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The physics of actinide compounds. By PAUL ERDÖS and JOHN M. ROBINSON. Pp. xi + 213. New York, London: Plenum, 1983. Price US $39·50.

Despite its general title this book is mainly concerned with the magnetic and to a lesser extent the electronic properties of actinide compounds. This topic is currently an area of active experimental and theoretical research, especially since the basic mechanism for the magnetic behaviour of the actinide compounds is as yet not well understood. In their review Erdös and Robinson place strong emphasis on the behaviour found for these materials in the vicinity of a variety of interesting phase-transition points; the various types are summarized in the introductory Chapter 1.

In Chapter 2 a review of experimental results of properties such as magnetic spin structure (usually determined by neutron diffraction), magnetization and susceptibility curves, electrical resistivity, specific heat, optical properties, thermal expansion and elastic constants is presented. As noted in their preface, the authors have been selective in their choice of material and included preferably only a number of typical examples rather than all experimental results in order to illustrate the general features of these materials. This choice certainly enhances the pedagogical appeal of the work. Research workers should however be aware of the fact that for more complete details on which studies have been undertaken for specific materials they should consult some of the other reviews quoted in Chapter 1 {*e.g.* Trzebiatowski [*Ferromagnetic Materials* (1980), Vol. 1, ch. 5, edited by E. P. WOHLFARTH. Amsterdam: North-Holland] for a review of ferromagnetic actinide compounds} or appropriate Abstracting Journals.

An excellent overview of theories that have been applied to the magnetism of actinide compounds is given in Chapter 3. Of those models that assume localized $5f$ electrons, the crystal-field model is described in particular detail, but its limitations as a valid description for the actinides is also clearly indicated. Spin Hamiltonians used to describe the $5f$ interactions are discussed, in particular RKKY exchange (applied to actinide compounds by Grünzweig-Genossar *et al.*) and Coqblin-Schrieffer exchange (modified and applied by Cooper *et al.*). First-order magnetic phase transitions as found in actinide compounds like UO_2 are discussed in terms of models based on the picture of localized $5f$ electrons. Theories of magnetic behaviour that involve itinerant electrons are discussed in less detail since fewer studies subscribing to this viewpoint have been undertaken thus far. However, in recent work it has become clear that for uranium compounds there is a change from localized to itinerant behaviour as their lattice parameters decrease. Therefore, itinerant descriptions are expected to receive increasing attention in future work. A most satisfying feature of this chapter is the way in which experimental results relevant to the theoretical work are introduced in the discussions.

The book is well written in an unpretentious style and excellent care has been taken with the technical aspects of the publication. A wealth of information is contained in 121 figures, most of which are reproductions of experimental results from the literature, and 20 tables. Very few inaccuracies have been observed. A minor one is the statement that the strain measurements on UP reported in Fig. 12 were performed on a single crystal. In fact this work was done on polycrystalline material; rather few studies on single-crystal UP have been reported in the literature because of the limited amount of UP single-crystalline material available. A more serious criticism may be made regarding the contrast that the authors make between the occurrence of a peak in the temperature dependence of the magnetization of USe and the apparent normal behaviour of US and UTe (p. 34, Fig. 27). Their presentation is misleading since the 'peak behaviour' has also been found in UTe [*Phys. Status Solidi A* (1972), **14**, K157], US [*J. Magn. Magn. Mater.* (1977), **5**, 106] and in β-U_2N_3 and U_3P_4 [*Phys. Status Solidi A* (1972), **9**, 317, 629]. Furthermore, as illustrated by the results for β-U_2N_3, U_3P_4 and