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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Superconductivity of transition metals their alloys and compounds. By S. V. VONSOVSKY, YU. A. IZYMOV and E. Z. KURMAEV, translated by E. H. BRANDT and A. P. ZAVARNITSYN. Pp. xiii + 512. **Springer Series in Solid State Sciences, Vol. 27.** Berlin: Springer-Verlag, 1982. Price DM 95.00.

This book is a translated and updated version of the Russian original from 1977.

The *Introduction* deals with considerations of the occurrence of superconductivity within the elements and very different chemical compounds, of the general theory of superconducting phenomena and of the peculiarities of transition metals with respect to superconductivity. In the following two chapters the theory of strong coupling superconductors and of the interplay between magnetic moments and the superconducting state (including the coexistence of magnetic ordering and superconductivity) is outlined in detail (chs. 1–3, about 180 pages).

The treatment of superconductivity in the pure transition metals (ch. 4) and the A15 phases (ch. 6) starts with the presentation of empirical correlations between T_c and other physical properties (electronic heat capacity, Debye temperature, magnetic susceptibility and so on). The largest part of these chapters is devoted to considerations of the contribution of electronic properties (band-structure calculations) and lattice factors to the electron interaction parameter (McMillan's theory), and to calculations of the electron–phonon interaction constant, and hence T_c values, from first principles. Here, as in the case of ch. 3, the experimental facts serve as an introduction to the theoretical problems or for the confirmation or disproof of theoretical models (170 pages).

The superconductivity of transition-metal alloys (ch. 5) is described from the experimental point of view and discussed mainly within phenomenological models. Miedema's model is worth mentioning because it throws light on the importance of chemical factors (*i.e.* electronegativity) for superconducting properties (28 pages).

From the residue of intermetallics (other than A15) and compounds with superconducting properties, only those are mentioned which are studied in more detail or which are of interest with respect to high T_c values (ch. 7). The discussion of the results is restricted to a qualitative consideration of the influence of the density of states and the phonon properties on T_c (about 60 pages).

Considering the large amount of data the authors arrive at the conclusion that high T_c values cannot be explained by electronic or phonon properties alone, but are always accompanied by a more or less pronounced lattice instability. Therefore, it seems logical that the book includes a chapter on high-temperature superconductors and lattice instability (ch. 8, 25 pages). Sometimes it has the character of an outlook on pathways for further work.

From the concept of the book I cannot understand why the authors devote a particular chapter (ch. 9) to the effects of irradiation of superconductors and why they do not integrate the relevant facts in the other parts of the book as they do with superconducting phenomena in amorphous materials and thin films.

The book seems to be written for physicists, but one can recommend it to chemists and materials scientists who are interested in the present state of the 'philosophy' behind superconducting phenomena. For non-specialists and students the book may serve as a first orientation in the vast amount of literature, since the experimental facts are well presented and illustrated by clearly arranged figures.

The book is a photoprint of a type-written manuscript with few misprints. The citation of literature is well balanced and contains many references to recent reviews of special topics. The value of the book suffers from the crude subject index and from the lack of an author index. The price seems acceptable.

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Physics of defects. Edited by R. BALIAN, M. KLÉMAN and J.-P. POIRIER. Pp. xxxi + 857. Amsterdam: North Holland, 1981. Price Dfl 375.00, US$174.25.

This book consists of the text of the lectures presented at the Les Houches Summer School, France, during August 1980. It contains 14 courses and several seminar reports, which cover a wide range of problems on the physics of defects.

The investigation of imperfect crystals – in particular, of crystals containing defects – is perhaps the main direction of modern solid-state physics, which makes its results so rich and interesting. During the past few years, concepts that invoke defects have been penetrating successfully into other branches of physics – from the physics of quantum liquids and liquid crystals to the theory of elementary particles and wave processes, and into other branches of science – chemistry, geology and biology. At the same time, rather general concepts of defects as distortions of ordered structures and new general mathematical approaches giving simple and clear results applicable to various specific systems are gradually being developed. The essential character of the approach of the school at Les Houches, and of this book, is to cover a large range of defects (from dislocations in crystals to wave-structure singularities, or to dislocations and disclinations in human fingerprints) occurring in various very different systems, and to use current approaches for their analysis.