

Magnetic ions in metals

Magnetic Ions in Metals: A Review of their Study by Electron Spin Resonance. By R. H. Taylor. Pp.+118 (Taylor and Francis: London, 1977.) £6.

THE first observation of electric spin resonance (ESR) was reported by Zavoisky in 1945. Since that time the ESR spectrum of every transition and rare earth ion has been observed in non-metallic solids in one valence state or another. The ESR spectrum is usually studied in single crystals to elucidate interactions between the magnetic ion and its local environment. As a result almost all features of these spectra are understood at least in terms of a phenomenological spin Hamiltonian. There have been many reviews of the properties of magnetic ions in non-metal host lattices: the important results and theory are collected in the encyclopaedic monograph of Abragam and Bleaney (1970). No similar authoritative volume has appeared on magnetic

ions in metals largely because the application of ESR to metals developed rather slowly; thus most of the important work has been done since 1970. The history of this development is well compiled by Dr Taylor in this welcome addition to the literature on magnetic resonance.

Reasons for the tardy growth in this particular area are to some extent lost to non-experts on metals, but metallurgical factors including single crystal growth have been especially important. I would hardly agree with the author that the rather dramatic arousal of interest since about 1970 is attributable to "increasing efficiency of spectrometer systems" or to "increase in spectrometer resolution", both experimental factors which have changed little since 1962. This book is conveniently divided into three major parts. After some introductory remarks, Dr Taylor gives a very good summary of the main applications of the ESR method to metals: studies of ground state splittings, the ESR bottleneck, exchange interactions of magnetic ions with conduction electrons, magnetic order in concentrated alloys, magnetic ions in type II superconductors are all discussed. But by far the major part of the monograph is concerned with

an experimental review of the spectra of magnetic ions in simple metals, binary alloys and intermetallic compounds. It may come as a surprise to some readers how few ions with well characterised spectra have been observed in metal host lattices. Most published work concerns the S-state ions Mn, Fe, Gd and Eu; far less has been achieved with non S-state ions, only Er, Dy, Yb and Ce having been observed at all. The monograph is completed by a most valuable review of possible growth areas for ESR studies of metallic solids.

The major strength of the book is that it says clearly what has been achieved up to 1975. It could have been improved somewhat by a more substantial discussion of both the folklore of the subject (for example, what systems have been tried but found not to work) and the theoretical background. But in all it is a well produced volume which will be a valuable addition to the bookshelf of both workers in the field and physicists more generally interested in magnetic resonance.

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Microbiological aspects of waste treatment

Treatment of Industrial Effluents. Edited by A. G. Gallely, C. F. Forster and D. A. Stafford. Pp. 378 (Hodder and Stoughton: London, Sydney, Auckland and Toronto, 1977.) £7.95.

THIS book combines the work of twenty-two authors in twenty-one chapters covering aspects of waste treatment from general description of the basic processes to the problems and treatment of specific industrial wastes. The depth of treatment varies from chapter to chapter, as might be expected with such a large number of authors. Some topics are dealt with in considerable detail and the authors in these cases quote numerous references; the chapter on Surfactant Biodegradation in Waste Waters is particularly valuable.

The editors should have avoided such obvious mistakes as on page one, where the statement is made that "activated sludge plants began to be operated by 1900 AD", when a later author in chapter 5 gives the correct date for the development of the process in 1914. There is also no reason in

chapter five to substitute the term 'trickle filters' for the professionally accepted terms of either 'trickling filters' or 'biological filtration'. In chapter 4 it is difficult to interpret the phrase in the section on the determination of nitrate and nitrite; "clean waste such as potable supplied".

The title of the book would have been more explicit if it had included the word 'microbiological'. The book is heavily biased to the microbiological aspects of waste treatment, and it would have been improved by including better information on the physical and physicochemical aspects of waste treatment and an introduction to the modern concepts of mathematical description of the processes.

Despite these criticisms, the book will be particularly useful to post-graduate students working in the field.

The amount of information presented in the book, which includes over 800 references, represents a very useful addition to the British textbooks available. The book is well produced and very readable and, compared to other similar books, is good value at the price.

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