account of the determination of atom sizes in MnO_4^- based on energy band theory.

The final chapter is devoted to a discussion on the nature of the chemical bond in some classes and groups of minerals and contains a clear statement of the author's thesis that ultimately the only satisfactory description of bonding which can be made must be based on the molecular orbital and energy band theories. This concept, in as far as it is currently possible, is then applied to the silicates, beginning with the nature of the chemical bond in SiO_4^{4-}, and using data both from X-ray and ESCA spectra. The treatment proceeds in outline to other cation polyhedra in silicates. This is followed by a wide-ranging discussion of the nature of the bonding in sulphides in the context of their energy band structures. The chapter ends with a very brief account of the hydrogen bond.

While this book is superficially extremely well produced and will certainly be much used for the data which it contains it is somewhat surprising that the standard of writing and editing is so poor. With a good knowledge of English it is usually possible to guess what the author means and it is perhaps unfair to be too critical in this context. However, the book, in addition, is full of avoidable misprints and it has clearly been very inadequately proof-read. I find if difficult to understand how a publisher, in presenting a book on the international market, and at a very high price, should fail so miserably on the simple matter of spelling.

J. D. C. McCONNELL

Marfunin (A. S.). *Spectroscopy, Luminescence and Radiation Centers in Minerals* (transl. from the Russian by V. V. Schiffer). Berlin, Heidelberg, and New York (Springer-Verlag), 1979. xii + 352 pp., 170 figs. Price DM 108.00; $59.40.

This is the second book on mineral physics by the Russian author A. S. Marfunin to appear this year. The first (*Physics of Minerals and Inorganic Materials*) is reviewed above. As the title implies, the second volume deals with some of the less familiar spectroscopic methods, namely Mössbauer, nuclear magnetic resonance (NMR), nuclear quadrupole resonance (NQR), X-ray spectroscopy, luminescence and thermoluminescence, and the properties of electron-hole centres. The arrangement of each of the six main sections is similar, with a description of the theory and general principles of the method being followed by a discussion of its applications to minerals. There is a list of 1023 references, classified according to the spectroscopic method used, and an adequate index.

The section on the Mössbauer spectroscopy is typical. Three of the 37 pages describe the basic theory of the Mössbauer effect and 15 the experimental arrangement, the types of spectra, and the origin and meaning of the isomer shift, quadrupole splitting, and hyperfine splitting. The remaining 19 pages are devoted to the Mössbauer spectra of minerals, notably silicates, oxides and hydroxides, and sulphides. There are 235 references, all but a few pre-1977. The whole constitutes a good introduction to Mössbauer spectra for the non-specialist, and a useful summary for the mineralogist specializing in this field.

The remaining sections, of which that on luminescence and thermoluminescence (101 pp., 271 refs.) is the longest, and that on NMR and NQR (22 pp., 101 refs.) is the shortest, follow a similar pattern. Taken with the accounts of electron paramagnetic resonance (43 pp., 148 refs.) and X-ray spectroscopy (38 pp., 95 refs.), they provide an extremely useful introduction to these less-known spectroscopic methods, and particularly to their mineralogical applications, and deserve to be widely read and applied.

In view of the scientific merits of the book, it is a pity that the author has been let down by his publishers, who have devoted insufficient effort to editing the translation and to proof reading. It is usually possible for the reader to discover what the author must have meant, but the path to enlightenment is made harder by the peculiar Teutonic phrasing and word-order that is often adopted, and by the incorrect use of words, e.g. 'negligent' for 'negligible'. Foreign companies publishing in English would do well to have their translations edited by native speakers of that language, even if the translation is done by others. The proof-reading is poor, with 'sheelite' (scheelite) throughout §7.3.13, and an unreasonably high concentration of other errors.

Despite these defects, the book is to be welcomed. Perhaps the second edition will be better produced.

R. G. J. STRENS

Barrer (R. M.). *Zeolites and clay minerals as sorbents and molecular sieves*. London and New York (Academic Press), 1978. viii + 497 pp., 181 figs. Price £25·00.

It is unfortunate that this review of an important monograph was delayed by late receipt of the review copy: apologies to Professor R. M. Barrer!

One of the great commercial successes in recent years has been the development of zeolites and clay minerals as sorbents and molecular sieves, not to mention parallel applications of zeolites as ion-exchangers and catalysts. The crisis in petroleum