agent, H_2O_2. The product of the transformation was white, powdery in form, optically active, and it could not be distinguished from the oxide layer present on the original surface. The initially flat surfaces of the Al_2O particles became so uneven that satisfactory electron microprobe traces could not be made; this feature indicates that a considerable volume expansion is involved in the transformation. It seems reasonable to assume that the product of the transformation is α-Al_2O_3. During the transformation the grain boundary hardening effects disappear and, in general, the grain boundary regions become softer than the grains.

These results indicate that the pest phenomenon is associated with the oxidation of Al_2O to α-Al_2O_3. This transformation probably occurs at internal boundaries by the diffusion of oxygen along the grain boundaries, and disintegration could then follow as a result of the internal strains produced by the volume expansion involved in the transformation. Such a process would open up the material along the grain boundaries and allow oxygen to diffuse further into the interior to continue the transformation.

A mechanism of this type is supported by the experimental observation that, when new surfaces were prepared in partially "pested" samples, precipitates in the bulk of the grains were still in the Al_2O form. The effect may be attributed to the extremely slow bulk diffusion of oxygen at room temperature, and would account for the striking feature of the pest observed by Westbrook and Wood [1] – that the individual grains in a "pested" sample could still undergo plastic deformation.

The factors which determine the formation of Al_2O and the mechanisms of grain boundary hardening will be discussed in detail in a later publication.

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Book Reviews

Crystal Physics

G. S. Zhdanov

Pp ix+500 (Oliver and Boyd, 1965). Translated from the Russian by A. F. BROWN 80*s*

Professor Zhdanov's book is a course book intended for senior undergraduates in metal physics and solid state physics. The author has drawn on 20 years' experience of teaching these subjects in the USSR to produce a textbook that requires little prior knowledge of materials science. The initial chapters give an interesting and readable account of elementary quantum theory, atomic structure, interatomic forces, chemical bonding and the symmetry of atoms, molecules and crystals. This leads naturally to a simple discussion of the crystal structure and cohesive energy of crystals, the electron band theory of solids and the electrical and magnetic properties of materials. At this point the emphasis changes to a consideration of phase equilibria, crystal growth, thermal properties, diffusion, and finally the mechanical properties of solids. Thus the text ranges over much of what is to be expected from the title with no notable omission. Inevitably, and the author acknowledges this, the scope of the book is so wide that some subjects are inadequately covered. Thus the discussion of semiconductors, superconductors, and dislocation theory is so condensed as to be virtually useless to many students. This inadequacy is not effectively remedied by the list of review articles and books in the bibliography.

The general layout and pattern of the book is good, containing many informative and useful tables that are well integrated with the text. Throughout, Professor Zhdanov's use of quantitative material is such as to encourage the student to get his units and ideas of energies involved in physical processes clear from the start. An important feature of the work is the use of Appendix 3 to indicate the solutions of some of the seminar questions appended to most chapters. The overall impression created by the book is of the simplicity and clarity of presentation of new physical concepts: consequently most students will derive some benefit from its use. The main criticism is the lack of originality shown by the author in some sections. This is never more apparent than in the chapter —"Phase Equilibrium and Phase Transformations in Alloys", which the well-versed student of physical metallurgy might mistake for passages from much earlier, well-used textbooks.

Despite its attractive qualities, this book does not constitute a "must" for inclusion on the average undergraduate's bookshelf. It is more likely to become a popular library reference book, since at 80s it certainly does not constitute a "best buy".

B. HENDERSON