

Book Reviews

Specialty Steels and Hard Materials

edited by N. R. Comins and J. B. Clark; published by Pergamon, Oxford and New York, 1983; 482 pp.; price, U.S. \$100.00, £55.50

This book contains the Proceedings of the International Conference on Recent Developments in Specialty Steels and Hard Materials held on November 8-12, 1982, in Pretoria, South Africa. The proceedings consist of 13 invited and 36 contributed papers. The range of topics covered is unusually wide, from rail steels (which can hardly be termed specialty steels) to the crystallography of diamonds, so few people will be reading the text in its entirety. There is the customary wide spread of quality of content among the papers and, as acknowledged by the publisher, the use of authors' typescripts in their original form does not make for pleasant reading.

The 13 plenary papers are as follows.

Rapid solidification processing and the control of structure-property relations

by M. Cohen

Microstructural design in low alloy steels

by R. W. K. Honeycombe

Maraging steels — structures, properties and applications

by B. Z. Weiss

Design of strong, ductile, duplex low alloy steels

by G. Thomas

A review of worldwide developments in stainless steels

by R. M. Davison *et al.*

Recent developments on the role of molybdenum in irons and steels

by M. Semchyshen

The use of vanadium in low alloy structural steels

by A. M. Sage

Toughness in high speed steels and hard metals

by H. F. Fischmeister

Microstructure and deformation aspects of some specialty steels and hard metals

by R. E. Smallman

Microstructural design and control of sintered hard metals

by H. E. Exner

Some reflections on the competition between hard materials in industrial applications

by B. Aronsson

The current status of diamond and cubic boron nitride composites

by P. N. Tomlinson and R. J. Wedlake

Development and performance of chemical vapor deposition coatings on cutting tools

by E. Rudy *et al.*

Cohen's paper is an up-to-date review of rapid solidification processing, with references from 1982 and the best illustrations in the book. Davison *et al.* provide an excellent review of the rapidly changing technology of stainless steels, the kind of paper that is particularly useful to teachers. Semchyshen has written a detailed account of the current use of molybdenum in cast irons and steels. Fischmeister's account of toughness in hard materials is well written, but some literature is omitted. Smallman's paper is a good summary of current knowledge of plastic deformation of metals and metal-bonded sintered carbides. Among other items, the use of boron nitride cutting tools to replace grinding of hardened steels is discussed by Aronsson and by Tomlinson and Wedlake. Diamond tools cannot be used because of interaction with iron. Polycrystalline diamond tools can be used to machine WC-Co sintered composites. Rudy *et al.* describe the quite remarkable improvement in the performance of cemented carbide cutting tools given by the chemical vapor deposition of coatings such as Al₂O₃, TiC, TiN and HfN, used singly or in combination. They state that currently 30%-35% of sintered carbide tools are coated.

Some of the contributed papers provide useful reviews of specific topics. Luyckx presents a good summary of current information on the Palmqvist test and its application to hard materials. Almond discusses the relation between microstructure and toughness in WC-Co composites, pointing out ways to increase toughness. Gugel reviews the processing and applications of non-oxide ceramics. Kingon and Davis provide phase diagrams for chemical vapor deposition of Si₃N₄ and SiC.

In other significant contributed papers, Krishnadev *et al.* report a synergism between copper and boron in the strengthening of high

strength, low alloy (HSLA) steel. Bucher discusses the substitution of as-hot-rolled HSLA steel bars for heat-treated forgings. Mostert and Van Rooyen confirm the fascinating superhardening effect in alloy steels reported earlier by Brown and James [1]. The prerequisites are a relatively high aluminum content (greater than 0.05 wt.%) and heating of the melt to at least 1650 °C. The authors found that the magnitude of the increase in hardenability depended on the base hardenability of the steel, in such a manner that $D_I(\text{superhardening}) = \{D_I(\text{base})\}^2$, when $D_I(\text{base})$ was greater than 55 mm. They discuss possible cost savings in alloying elements but do not discuss the costs related to superheating of the melt. Hulka *et al.* report on the effects of rolling schedules and alloying on the properties of pipe steels. Data were obtained from 200 kg laboratory ingots embedded in standard slabs before rolling.

Author and subject indexes are provided.

Because of the wide range of topics covered in this book, it is not likely to appeal to a large number of individual purchasers. However, it contains significant results that should not be lost and therefore it should be in every well-stocked library of materials information.

W. C. LESLIE
*Department of Materials and
 Metallurgical Engineering
 The University of Michigan
 Ann Arbor
 MI 48109
 U.S.A.*

1 G. T. Brown and B. A. James, *Met. Technol.*, 7 (1980) 261.

Advances in X-ray Analysis, Vol. 26

edited by C. R. Hubbard, C. S. Barrett, P. K. Predecki and D. E. Leyden; published by Plenum, New York, 1982; 473 pp.; price, U.S. \$62.50

This volume contains 64 papers presented at the 1982 Denver Conference on the Application of X-ray Analysis, covering accuracy in X-ray powder diffraction (six papers), search

and match procedures and powder diffraction file (seven papers), quantitative X-ray diffraction analysis (eight papers), X-ray diffraction applications and automation (seven papers), X-ray stress measurements (eight papers), fatigue shape memory and fracture characterization (four papers), the use of position-sensitive detectors (two papers), new X-ray fluorescence instrumentation and techniques (five papers), X-ray fluorescence computer systems and mathematical corrections (nine papers) and general applications of X-ray fluorescence (eight papers). About 100 pages (printed from typescripts provided by the authors) are devoted to powder diffraction, and the papers assembled under the heading "Accuracy in X-ray powder diffraction" reflect the contents of the conference plenary session organized by C. R. Hubbard around this theme. Some of the leading experts provide a broad coverage of all aspects of accuracy, from angle and intensity measurements, alignment and correction procedures to precision lattice parameter determination.

As usual in this series, this volume too offers a wealth of information on practical aspects of X-ray diffraction for structural and analytical studies. The broad range of analytical applications discussed here will be useful for all those actively working with X-rays. The parts devoted to powder diffraction, including a good selection of references, are invaluable to the large group of researchers using this technique and to those entering the field.

G. KOSTORZ
*Institut für Angewandte Physik
 Eidgenössische Technische Hochschule-
 Hönggerberg
 CH-8093 Zurich
 Switzerland*

Physicochemical Aspects of Polymer Surfaces

edited by K. L. Mittal; published by Plenum, New York, 1983; 1250 pp.; price, U.S. \$75.00 (Vol. I), U.S. \$85.00 (Vol. II)

At the Meeting of the American Chemical Society in New York City on August 23-28,