

Book Review

Ceramic Materials for Advanced Heat Engines: Technical and Economic Evaluation. By D. C. Larsen, L. R. Johnson, J. W. Adams, A. P. S. Teotia and L. G. Hill. Noyes Publications, Park Ridge, New Jersey, 1985. 380 pp. ISBN 0-8155-1029-2. Price: \$45.00.

This book is a compilation of two reports, one on the properties of ceramics and a second on an economic analysis of structural ceramics, produced for the Air Force Wright Aeronautical Laboratories and the Department of Energy, respectively. As such, both the strength and weakness of the publication can be traced to the source literature.

The first part of the book is divided into 13 sections, dealing in a most comprehensive manner with the property evaluation and materials characterisation of candidate materials, notably the many forms of silicon nitride and silicon carbide which are available. Of the many properties evaluated the fracture toughness was omitted.

Microstructural characterisation has been limited to optical microscopy, surprising in that the grain size of many of these materials is close to the limit of resolution. Also, since so many of the reported properties depend on the presence of a second phase, particularly a grain boundary phase, it is unusual that electron optical techniques have not been utilised. A specific criticism may be levelled at the standard of the micrographs which is generally very low and in several cases, appalling. At least half of the micrographs could be usefully omitted.

The section on the zirconia ceramics is limited to PSZ-type materials and although SEM was employed to examine fracture surfaces little or no useful information is gained from examination of the micrographs. In the fast developing field of zirconia-based engineering ceramics the properties of the TZP ceramics and the two phase $\text{ZrO}_2\text{--Al}_2\text{O}_3$ have not been reported.

The second section of the book, dealing with the economic evaluation of

ceramic materials for engine applications, gives an interesting insight into the possibilities available for ceramics, particularly applied to the US market and where Japan and to a lesser extent Germany are seen as the technological competitors. There are chapters in this section which make interesting reading, particularly on strategic materials, and several translated articles from Japanese newspapers.

As a whole the book suffers from lacking a unified theme. There is a most useful compilation of mechanical data, but little insight is given as to where or how these data might be employed or related to the poorly described microstructures. It is a medium priced book, which might be considered for a library reference section, and would have proved far more useful to a wide section of the ceramics community if the micrographs describing the materials tested had been of a higher quality and had been better reproduced.

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