

for any researcher considering working in these branches of the silicon nitride field, and for engineers and scientists planning to use silicon nitride. They save time which would otherwise be spent designing and undertaking personal (even on-line) literature searches; and in a subject area as extensive and as complex as that of silicon nitride this is no small consideration. It is a common complaint about many papers that the authors do not seem to have properly read the international literature. These Gmelin Handbook volumes may be said, up to a point, to have the great merit of making reading this literature unnecessary, in that the recent literature on silicon nitride has been read and digested, and the important chemical information extracted. Provided access to these volumes can be obtained there is now no excuse at all for any author not to be fully conversant with important facts and data, or at least not to be aware of the existence of significant papers. For the scientific literature of the last 3 to 4 years there is unfortunately no short cut and current issues of Chemical Abstracts or other indexing systems, or the journals themselves, must be consulted.

These two new volumes on silicon nitride are very much welcomed, and the Gmelin Institute and its editor Friedrich Schröder are to be congratulated on the outcome of an undertaking of considerable magnitude. The volumes contribute towards providing a detailed and invaluable picture of the present state of knowledge of the underlying basic chemistry of what must be the most thoroughly researched technical ceramic materials of the past 25 years. At the price of just over £1600 for the two volumes there will not be many personal buyers, but it is to be hoped that institute libraries can be encouraged to add them to their Chemistry Sections' Gmelin Handbook volumes.

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Advances in Particulate Materials. By A. Bose, Butterworth-Heinemann, Boston, 1995. ISBN 0-7506-9156-5.

Advances in Particulate Materials is divided, apart from the introductory chapter (50 pages), into five main chapters. The first deals with 'Chemical powder production approaches' (31 pages) while the second deals with 'Melt atomization' (71 pages), followed by chapters on 'Mechanical alloying' (49 pages), 'Intermetallic compounds' (51 pages) and 'Particulate injection moulding' (37 pages). An eight page index concludes the book.

In the introduction a concise overview is given of powder characteristics consolidation techniques and applications. Particularly relevant is a five page section on hazards associated with the use of particulate materials.

The chapter on 'Chemical powder production approaches' deals with various techniques; for example the reduction of oxides, the use of organo-metallic chemistry, powders from salts and by chemical vapour deposition. It is argued at various points that 'lack of proper co-ordination between chemists and powder metallurgists is the only reason why chemical powder processing has not become a tremendous commercial success'. For ceramics one has to add the fact that the price of these powders is also frequently an obstacle. The main emphasis is on metallic powders.

Melt atomization is devoted to processes which use disintegration of liquids into a fine spray of droplets by high-velocity fluids, by centrifugal forces, by vibrational energy or otherwise. Again the main emphasis is metallic powders.

In spite of the long tradition in milling, the fabrication of powders by mechanical alloying is a field in which rapid progress has been made and where new materials have emerged. In ceramics the impact of milling techniques on the size and size distribution is well known but also the influences on chemical reaction is profoundly present. For metals, improved powders and thereby microstructures are obtained. In particular the dispersion of brittle particles in ductile matrices can be considerably enhanced.

The chapter on intermetallic compounds deals more with the properties of this class of materials than with their fabrication. I find this chapter interesting as such but not very well positioned in this book. The final chapter gives a short overview of the process details on injection moulding. The well-known book by German is frequently referenced.

Powder metallurgy in its widest meaning is becoming more and more important in manufacturing industry. The description 'Powder Metallurgy' is misleading since the discipline not only includes metal powders but also ceramic powders. In the introduction of this book a plea is made for changing the meaning of the abbreviation P/M from 'Powder Metallurgy' to 'Particulate Materials'. I fully agree with this suggestion and introducing it in the title may help to disseminate this view. However, only limited attention is given to ceramic powders in spite of the intention expressed in this introductory chapter. This is an important drawback of the book for ceramists. Also, a book entitled 'Advances in . . .' awakens the impression that the latest developments in the state of the art

are described. Although at a number of places this is done, the major part of the book deals with information at an overview level. I take one, striking example. In the chapter on injection moulding a 16 page section is given on sintering aspects. The content of that section is introductory/elementary. Although this approach makes the book somewhat more self-contained, it also makes the title (slightly?) misleading. As can be expected from a book with this intention, the background

to various formulae given is geneally limited. The number of obvious mistakes is limited. On the whole the book is well illustrated and readable. The final impression thus somewhat mixed and people may (rightfully) hesitate to buy a personal copy.

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