
The 4th edition of the well-known book by the late Dr. Trent co-authored by Dr. Wright is a refreshing one without losing the lucidity and originality of the first edition. As most cutting tools are produced through the sintering route, a sound knowledge of work piece–tool interaction is desirable. It is here that the role of a physical metallurgist comes in. Dr. Trent did a yeomen service in writing this book, a topic ever touched by a metallurgist. The author was the first to propose the concept of diffusion wear of WC based cemented carbides during steel cutting, a feature felt by the mechanical engineers but not having a scientific solution. In addition the role of dedicated metallographic studies in understanding machining has been propounded excellently. For materials scientists and engineers the chapters 6-8 related to tool materials i.e. High-speed steels, cemented carbides and Ceramic tools are of great significance. In addition the chapter on machinability is also written with due preciseness. Other chapters, perhaps written by the coauthor are mainly related to production engineering. The last chapter No. 14 is Exercises for Students. It would have been very desirable if the authors had included some solved numerical problems and also given the answers of the problems. The book is useful to both beginners and the experts. The former group has to read it rather selectively.

G.S.Upadhyaya


The authors of the book are well known in USA P/M Industry. They got the inspiration to write this from the book of Dr. Gordon Dowson (U.K.) entitled “Powder Metallurgy, the process and its products”(1990), which is now out of print. The book contains 14 Chapters, whose details are as follows:

Chapter 1-Why is Powder Metallurgy important; Chapter 2-0 Visual Basics-A Quick Tour of Powder Metallurgy; Chapter 3-Metal Powder Properties and Production; Chapter 4-Compaction; Chapter 5-Sintering; Chapter 6- Repressing; Chapter 7-Secondary Machining; Chapter 8-Heat Treating of Powder Metallurgy Parts; Chapter 9- Secondary Operations; Chapter 10-Standards for Powder Metallurgy; Chapter 11-Quality Assurance; Chapter 12-Other P/M Forming Operations; Chapter 13- Case Histories; Chapter 14- A Brief History of P/M

The style is narrative and easy to read. The reviewer would prefer to comment on Chapter 5 –Sintering, which is of much relevance to the readers of this Journal. The Chapter spans 45 pages and contains 24 Figures. There are three subdivisions: 1.Definition of Sintering and How and Why of the Process; 2.Sintering Practice, and finally 3. Sintered products like Bronze, Brass, Copper infiltration of steel and stainless steel. It is not clear why
the authors prefer to write on sintering plain Fe-C alloys in the tail end of the Chapter under the heading ‘Sintering and the resultant properties of parts.’

It would have been better if the authors had classified Sintering under solid state and liquid phase sintering. In Chapter 8 while talking about various forms of iron crystal structures the authors are wrong in saying that austenite (FCC) is a more open structure than ferrite (BCC) (page 197-198). Such a statement would merely confuse the readers. The most interesting Chapter is on Case Histories, which contains 24 cases each covering a single page. Each case includes one picture, which is very helpful in understanding the complexities in shapes. The Appendix entitled P/M Genealogy (65 pages), briefly highlights the PM Industries in USA giving their origin and any changes etc. The last Chapter ‘A Brief History of P/M in North America’ would have found an appropriate place in the Appendix rather than in the main bulk of the book. The most inconvenient part of the book for international readers is the adoption of units like degree F, ksi, with which we are not conversant any more. I least like Appendix B ‘Primer References’, in which all references pertain to USA and none from Europe, which has published outstanding books. In brief the book is suited as a primer for the beginners in the P/M Industry and that too in USA,

G.S. Upadhyaya


Abstract

FUNDAMENTAL PROBLEMS OF MATERIALS SCIENCE

1.1. Mechanical activation and mechanochemical synthesis of materials. Obtaining new materials using classical technologies brings to the forefront the development of tribophysical and tribochemical methods used for powder production. All the more, as mechanical activation can transform the starting components into a metastable (amorphous) state. This can even lead to mechanochemical synthesis.

In an open system, which is not in equilibrium, such as a system in which a tribophysical process occurs, kinetic phase transformations are possible. They are accompanied by processes of internal structural self-organization. Changes of dissipative structures can also be caused by the occurrence of fluctuations for critical values of system parameters, or by changes of external parameters, that lead to the disappearance of the starting stable state and dynamical reorganization of dissipative structures.

1.2. Kinetics and mechanism of the sintering process. Starting with an activated volume, a general parameter defining system defectivity, a connection can be established between different approaches to describing the kinetics and mechanism of sintering. Such an approach is of universal significance and can be applied to crystal, ultradisperse and amorphous materials.

However, it is interesting that sintering is again being viewed as a simultaneous process of the reduction of system porosity and grain growth.

Sintering of ultradisperse powders occurs due to particle slipping along interfaces due to a dislocation mechanism responsible for the formation of excess vacancies in the system.