
HANDBOOK OF MATERIALS FOR PRODUCT DESIGN

Charles A. Harper Editor in Chief

Technology Seminars, Inc., Lutherville, Maryland

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PREFACE

While the role of materials has always been important in product design, materials are now often the keystones for successful products in our modern world of high technology. In fact, it might even be said that materials are the critical limiting factor for achieving the high performance and reliability demanded of today's products. Next generation's products usually require new or improved materials, and necessity often becomes the mother of invention. Materials scientists always rise to meet the need.

Success in achieving outstanding materials is not adequate, however. Since most product designers are mechanical or electrical engineers, and since materials are chemical, these significantly different technical languages lead to a critical knowledge and understanding gap. Successful product design requires, first, bridging this technical language barrier gap and, second, providing the product designer with the information, data, and guidelines necessary to select the optimum material for a given product design. It is the purpose of this *Handbook of Materials for Product Design* to provide both an understanding of the many classes of materials that the product designer has available to him, and the information, data, and guidelines that will lead the product designer to the best choice of materials for his specific product. Toward this end, this book has been prepared as a thorough sourcebook of practical data for all ranges of interests. It contains an extensive array of materials properties and performance data, presented as a function of the most important product variables. In addition, it contains very useful reference lists at the end of each chapter and a thorough, easy-to-use index.

The chapter organization of this *Handbook of Materials for Product Design* is well suited for reader convenience. The initial three chapters deal with metal materials—first, the important ferrous metals, then second, the broadly used aluminum metals and alloys, and third, metals other than those covered in the first two chapters. The second set of three chapters covers polymeric materials first, the all-important group of plastic materials, then, second, that specially reinforced group of plastics known as *composites*, and third, that important group of rubbery polymeric materials known as *elastomers*. Next come two chapters on the two major groups of nonmetallic, inorganic materials, namely, ceramics and glasses. These are followed by two chapters on finishes, first organic finishes and paints, and second, electrodeposited or electroplated metallic finishes.

Following all of the above chapters on specific groups of materials are two chapters on the always critical and often difficult areas of bonding materials. First is a chapter on the joining of plastics, with explanations of the various processes and their trade-offs. Next comes a very practical and useful chapter on the many adhesive bonding materials, techniques, and processes, along with their trade-offs.

The final two chapters in the book are both increasingly important and critical in modern product design applications. First is a chapter on materials testing and reliability, and second is a chapter on material recycling. These are especially important, since they affect not only optimum product design but also environmental and even legal issues.

The result of these presentations is an extremely complete and comprehensive single reference text—a must for the desk of anyone involved in product design, development, and application. This *Handbook of Materials for Product Design* will also be invaluable for every reference library.

As will be evident from a review of the subject and author listings, I have had the good fortune to be able to bring together a team of outstanding chapter authors, each with a great depth of experience in his or her field. Together, they offer the reader a base of knowledge as perhaps no other group could. Hence, I would like to give special credit to these authors in this preface.

It is my hope and expectation that this *Handbook of Materials for Product Design* will serve its readers well. Any comments or suggestions will be welcomed.

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ABOUT THE EDITOR

Charles A. Harper is President of Technology Seminars, Inc., of Lutherville, Maryland. He is widely recognized as a leader in materials for product design, having worked and taught extensively in this area. Mr. Harper is also Series Editor for the Materials Science and Technology Series and the Electronic Packaging and Interconnection Series, both published by McGraw-Hill. He has been active in many professional societies, including the Society of Plastics Engineers, American Society for Materials, and the Society for the Advancement of Materials Engineering, in which he holds the honorary level of Fellow of the Society. He is a past President and Fellow of the International Microelectronics and Packaging Society. Mr. Harper is a graduate of the Johns Hopkins University, Baltimore, Maryland, where he has also served as Adjunct Professor.