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# Plastic Product Material & Process Selection Handbook


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# Preface, acknowledgement

This book is for people involved or to be involved in working with plastic material and plastic fabricating processes that include those concerned or in departments of material, processing, design, quality control, management, and buyers. The information and data in this book are provided as a comparative guide to help in understanding the performance of plastics and in making the decisions that must be made when developing a logical approach to fabricating plastic products to meet performance requirements at the lowest costs. Information and data can also be used when compromises have to be made in evaluating plastics and processes. The book is formatted to allow for easy reader access and this care has been translated into the individual chapter constructions and index.

This book has been prepared with the awareness that its usefulness will depend on its simplicity and its ability to provide essential information.

The information and data presented in this book are not intended to be used as a substitute for more up-to-date and accurate information on the specific plastics and processes. Such specific details can be obtained from in-house sources, testing laboratories, computer databases, material suppliers, data/information sources, consultants, and various institutions. References in this book represent examples for additional sources of plastics and processes.

This book was written to serve as a useful reference source for people new to plastics as well as providing an update for those with experience. It highlights basic plastic materials and processes that can be used in designing and fabricating plastic products. As with designing any material and/or using any process for plastic, steel, aluminum, wood, ceramic, and so on, it is important to know their behaviors in order to maximize product performance-to-cost efficiency. This book provides

information on the behaviors and processing of the different plastics and primary fabricating equipment including upstream and downstream auxiliary equipment. The information is interrelated between chapters so it is best to review more than one chapter to maximize you understanding the behavior of plastic materials and processes.

Designing to meet product performance and cost depends on being able to analyze the many diverse plastics and processes already existing. One important reason for this approach is that it provides a means to enhance the users' skills. It calls for the ability to recognize situations in which certain plastics and processing techniques may be used and eliminate potential problems.

Problems that are reviewed in this book should not occur. As explained they can be eliminated so that they do not effect the product performance when qualified people understand that the problems can exist. They are presented to reduce or eliminate costly pitfalls resulting in poor product performances or failures. With the potential problems or failures reviewed there are solutions presented. These failure/solution reviews will enhance the intuitive skills of those people who are already working in plastics. Cross-referencing of many pertinent behavior patterns is included so one will better understand the advantages and limitations that can develop with improper approaches.

Products reviewed range from toys to medical devices to cars to boats to underwater devices to containers to springs to pipes to buildings to aircraft to spacecraft and so on. The reader's product to be designed and/or fabricated can directly or indirectly be related to plastic materials, fabricating processes, and/or product design reviews in the book.

This book makes very clear the behavior of the 35,000 different plastics with the different behaviors of the hundreds of processes. It concentrates on the important plastics and processes used to fabricate products. The result is a complete logical approach to designing that involves the proper use of materials and fabricating processes.

Information contained and condensed in this book has been collected from many sources. Included is the extensive information assembled from worldwide personal experience, industrial, and teaching experiences of the two authors totaling over a century. Use was also made of worldwide information from industry (personal contacts, material and equipment suppliers, conferences, books, articles, etc.) and major trade associations. For someone to collect this information would require the person having familiarity in the many facets involved in the plastic industry worldwide.

The information contained in this book is not available on the Internet. The Internet contains an extensive amount of useful and important information that can be used but it is reviewed under many different subjects. However it does not contain all the information in this book.

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*The Rosatos*
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# About the authors

## Dominick V. Rosato

Since 1939 has been involved worldwide principally with plastics from designing-through-fabricating-through-marketing products from toys-through-commercial electronic devices-to-aerospace and space products worldwide. Experience includes Air Force Materials Laboratory (Head Plastics R&D), Raymark (Chief Engineer), Ingersoll-Rand (International Marketing Manager), and worldwide lecturing. Past director of seminars and in-plant programs and adjunct professor at University Massachusetts Lowell, Rhode Island School of Design, and the Open University (UK). Has received various prestigious awards from USA and international associations, societies (SPE Fellows, etc.), publications, companies, and National Academy of Science (materials advisory board). He is a member of the Plastics Hall of Fame. Received American Society of Mechanical Engineers recognition for advanced engineering design with plastics. Senior member of the Institute of Electrical and Electronics Engineers. Licensed professional engineer of Massachusetts. Involved in the first all plastics airplane (1944/RP sandwich structure). Worked with thousands of plastics plants worldwide, prepared over 2,000 technical and marketing papers, articles, and presentations and has published 25 books with major contributions in over 45 other books. Received BS in Mechanical Engineering from Drexel University with continuing education at Yale, Ohio State, and University of Pennsylvania.

## Donald V. Rosato

Has extensive technical and marketing plastic industry business experience from laboratory, testing, through production to marketing, having worked for Northrop Grumman, Owens-Illinois, DuPont/

Conoco, Hoechst Celanese, and Borg Warner/G.E. Plastics. He has written extensively, developed numerous patents within the polymer related industries, is a participating member of many trade and industry groups, and currently is involved in these areas with PlastiSource, Inc., and Plastics FALLO. Received BS in Chemistry from Boston College, MBA at Northeastern University, M.S. Plastics Engineering from University of Massachusetts Lowell (Lowell Technological Institute), and Ph.D. Business Administration at University of California, Berkeley.

### Matthew V. Rosato

Has a strong, Marine Corps influenced, skill set in information technology and software application areas, which has been helpful in constantly updating and keeping current the numerous plastic material and process selection reviews in this book. He is presently a bachelors candidate at Ohio State University, and is involved in technical marketing projects with Plastics Fallo.

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