



Book Review

The fields of structural engineering and materials engineering have developed rapidly to fill the great escalating industrial need for specialized polymeric materials and composites. Particulate-filled polymers, foams, and high impact polyblends are now common, and new applications are continually being developed. Polymer technology has truly matured in recent years and a wide variety of books at different levels have been published in the area. The books seem to fall into two categories: those at a very high mathematical level and those at only a descriptive level. Nielsen and Landel's book fills the void between these two categories. Written from the perspective of the practitioner, the book is intended for use as a reference guide for researchers of diverse academic backgrounds involved with polymers or composites, or as a text for undergraduate engineering majors. The book presents a systematic overview of the field so that readers can understand and appreciate the causes and effects of mechanical considerations in the development and utilization of these materials, from design to reliability performance. The material is very accessible to a beginning student with even a college freshman educational background. Care is taken to define terms, and summaries are included at the end of the chapters. The mathematical level is generally elementary matrix theory and calculus. The important theoretical and mathematical results are given without extensive derivations, and the results are well explained in physical terms. Cause and effect diagrams provide an excellent overview of all major parameters that affect a particular problem or process. Whenever possible, extensive tables and figures, generic and specific, provide an excellent aid to help the reader understand and use the mathematical results.

The book is organized into 8 chapters that provide a qualitative and coherent perspective of the mechanical issues pertaining to polymers and composites. The organization of the material is generally logical and well planned. The first chapter is an overview of mechanical tests and identification of polymer transitions. Chapters 2 and 3 review basic concepts of moduli, creep, and stress relaxation.

Chapter 4 covers dynamic mechanical properties in a straightforward manner that allows the reader to develop a basic under-

Title: MECHANICAL PROPERTIES OF
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standing of various types of responses. In Chapter 5, Nielsen and Landel present the main issues that concern practitioners: the relationship between stress-strain behavior and strength. Chapter 6 deals with environmental impact on the mechanical performance of polymers including heat effects, fatigue, friction, and abrasion resistance. The last 2 chapters, Chapters 7 and 8, present selected topics highlighting performance of composites, including slurries and reinforced solids. To deal with the mechanical differences between classical materials and composite materials, the concept of anisotropy is introduced and thoroughly discussed, but at an elementary level. Nielsen and Landel use the information and concepts presented

in the previous chapters to lead the reader smoothly through new developments in these fields.

Each chapter has a list of about 15 problems for the reader to solve. The problems are generally very straightforward applications of the material presented. However, no answers to the problems are included at the end of the book.

In summary, this book is a very good introduction to the overall technology of mechanical performance of polymers. Nielsen and Landel's approach contrasts with the approach of books focused only on mathematical representation of stress-strain phenomena or the associated theoretical models. Nielsen and Landel present the material in a clear and concise manner that enables the reader to develop an intuitive feeling for the subject. The book is an excellent guide because the presentation of the topics is thorough, insightful to the needs of the applied researcher, and authoritative. The book is also valuable as a self-study guide for scientists who are just moving into the field of polymers. The references (over 2000) support the technology broadly and in depth, and may be of real value in helping readers to efficiently acquaint themselves with specific topics. As a book for an undergraduate course, I feel that the instructor might want to embellish the material with additional example problems of the results presented.

In my opinion, this book is one of the best introductory texts covering the general field of mechanical performance of polymers.