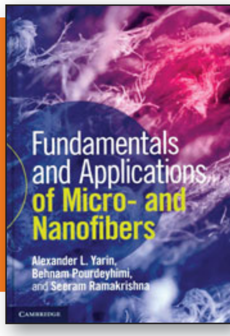


Fundamentals and Applications of Micro- and Nanofibers

Alexander L. Yarin, Behnam Pourdeyhimi, and Seeram Ramakrishna

Cambridge University Press, 2014
442 pages, $99.00
ISBN 978-1-107-06029-6

This is a comprehensive book on the technology of polymer and glass fibers, with an emphasis on the physical approach, intended for all levels of scientists, engineers, and students. The authors state in the preface that one intention of writing this book is to summarize their own results of research in this area. They write the book as a source book, comparable in scope and intention to the classic book in fiber science by A. Ziabicki, *Fundamentals of Fibre Formation* (Wiley, 1976). The authors did a wonderful job and produced a handy summary of the present status of micro- and nanofibers.

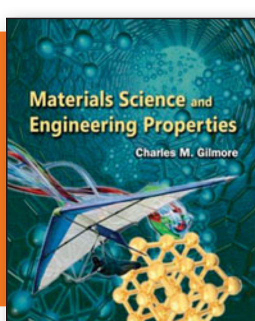
Chapter 1 briefly mentions major methods and underlying physics. However, major technologies for micro- and nanofibers, melt- and solution blowing, and electrospinning appeared in Ziabicki's book. In this regard, the present book is a logical extension of fiber science and engineering.

Chapters 2 and 3 provide backgrounds of the methodologies developed by the present authors for micro- and nanofibers. Chapters 4–6 occupy 65% of the book in terms of length, and cover blowing and electrospinning in great detail. The remainder of the book (chapters 7–11) is concerned mainly with applications, and covers such interesting topics as tensile properties, post-processing, nanofluid, military uses, novel roles in drug delivery, health supplements, and cosmetic facial masks. Apparently, however, major applications are yet to appear for micro- and nanofibers in order to play prominent roles in industry.

There is an absence of chemical formulae of polymers used for micro- and nanofibers throughout this book. Synthetic fibers are regarded as an application of polymer chemistry, and physical behaviors of synthetic fibers are interpreted in terms of chemical formulae of polymers, degrees of polymerization, and conformations of polymer chains. However, now I recognize another way of viewing them as an engineering material that can be described by viscoelastic behaviors, rheological flow properties, non-Newtonian fluid dynamics, and aerodynamics. Nevertheless, neither approach is correct by itself, as chemists are finding more and more evidence for nanoparticles being not only very large molecules but also showing behaviors and properties unique to the nano-size. A hybrid strategy of mixing the engineering approach mentioned in this book with the chemical approach is clearly desirable. An ideal example would be carbon nanotubes, which are nanofibers according to their shapes, but grow in the plasma state of carbon. Carbon fibers, established carbon materials being used with increasing frequency as structural materials for cars and airplanes, are also missing from this book.

In spite of the minor suggestions given, I recommend this book as a highly valuable milestone in the engineering approach to polymer fibers, including micro- and nanofibers.

Reviewer: Eiji Ōsawa *is Professor Emeritus of Toyohashi University of Science and Technology and the President of NanoCarbon Research Institute Limited, Ueda, Japan.*



Materials Science and Engineering Properties

Charles M. Gilmore

Cengage Learning, 2014
704 pages, $155.49
ISBN 9781111988616

This is an excellent textbook for students or engineers who are majoring in materials science and engineering. This volume uses an integrated approach to explain the physical principles behind engineering behaviors. It contains15 printed chapters and three online chapters.

Chapter 1 introduces the brief history of materials science through different categories of ceramics, metals, polymers, and composites using examples of a ceramics figurine, cars, turbine engine, and advanced testing equipment. The scope of materials science is well-defined. Chapter 2 introduces the crystal structures and chemical bonding of engineering materials, which provide useful data and formula of atomic physics. Chapter 3 summarizes the most common defects in materials such as point, linear, and three-dimensional defects in materials. Chapter 4 introduces the rearrangement of atoms by using thermodynamics and kinetics principles, and covers how these principles affect heat and mass transfer properties. Chapter 5 thoroughly explains the classic phase-diagram theory in the most understandable way. Specifically, the phase diagrams for liquid polymers are introduced, which is really unique. Chapter 6 briefly introduces the mechanical behavior of materials, and chapter 7 follows up to introduce how to improve the mechanical properties. Chapter 8 very specifically introduces common engineering materials and their applications. The introduction of classifications