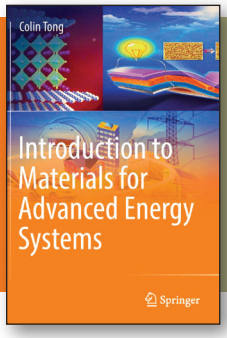


Introduction to Materials for Advanced Energy Systems

Colin Tong
Springer, 2019
911 pages, $119
ISBN 978-3-319-98002-7 (eBook)

This textbook reviews various materials used in all types of energy systems—both traditional and advanced. Energy systems cover a wide range, from energy sources, to conversion methods, and to storage options. Renewables and sustainable energy systems are the current focus of developmental activities.

The book addresses energy and the environment from a materials science and engineering point of view. It is divided into 12 chapters. The first chapter is a general introduction to all types of energy systems—not only advanced energy systems, but also well-established ones. The second chapter is a cursory introduction to the science and engineering of different materials used in energy systems. It also highlights materials characterization and testing techniques.

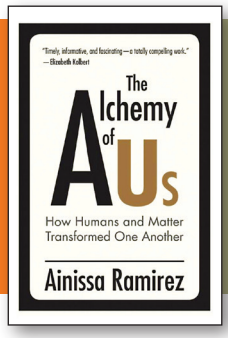
The following chapters deal with materials used in various energy systems, such as fossil, solar, geothermal, and wind. Chapter 3 covers materials used in fossil fuel energy systems, including how materials play an important role in improving efficiency and reducing greenhouse gas emissions. Chapter 4 discusses solar-energy materials (e.g., photovoltaic, thermal collectors, solar absorbers), and Chapter 5 describes materials used in the geothermal industry, including pumps, heat exchangers, drill bits, and cementing of wells. Chapter 6 focuses on wind energy and materials used in making wind turbines and for energy conversion.

Chapter 7 deals with materials for hydropower and other ocean-based energy systems, such as tidal, wave, ocean current, ocean thermal, and salinity gradient. Chapter 8 focuses on biomass and bioenergy materials, whereas Chapter 9 covers hydrogen as a fuel source and energy-storage medium and various types of fuel-cell technologies. Various materials used as nuclear fuels, fuel cladding, moderators, reflectors, coolants, and structural aspects of current and new fission reactors are covered in Chapter 10. Chapter 11 describes the science behind emerging materials for energy harvesting, such as thermoelectric, piezoelectric, pyroelectric, triboelectric, magnetoelectric, and other hybrid systems. Future trends such as metamaterials, nanomaterials, artificial photosynthesis, and zero-point energy are described in Chapter 12.

The book succeeds in comprehensive coverage of materials used in energy systems, their current usage, new developments, and future prospects. It covers the core science behind new systems from nano, through micro, to macro systems. Each chapter includes recent references. It is written in simple language but assumes some basic background in materials science. If anyone wants to make an investment decision in the energy sector, he/she needs to know the future trends in the energy systems. This book highlights such R&D activities.

Overall, it is a good book for engineers and managers who are involved in any energy industry, renewable or otherwise. The reader should have a good understanding of the science and engineering aspects of materials, starting with quantum physics and electrochemistry, to fully comprehend some of the new developments. This book gives a nice overview of developments in competing energy systems, which is valuable to business executives in the energy industry.

***Reviewer: Chinnia Subramanian**, Technical Consultant, EnMat Solutions Inc., Canada.*



The Alchemy of Us

Ainissa Ramirez
The MIT Press, 2020
328 pages, $55.00
ISBN 978-0-262-04380-9

What do Ruth Belville, Albert Einstein, Louis Armstrong, and David Eagleman have in common?

In unpredictable ways, Ainissa Ramirez melds their stories together as she mixes social history with materials science in a fascinating book for the general public. She presents more than a synergistic relationship between science and societal needs. *The Alchemy of Us*, Ramirez writes, "shows how materials were shaped by inventors, but also how those materials shaped culture." This angle, then, also renders the book interesting for the materials research community.

For example, in the Western world, the invention of artificial light led to a new sleep pattern, which then drew a need for human-made timepieces. That, in turn, altered our construct of time. This is where Ruth Belville comes into the story.

In 1908, Belville made her rounds in London with her trusty pocket watch named Arnold. Because of exquisite developments in materials science accomplished by an inventor born 200 years earlier, the steel spring—along with the brass gears and ruby pivots—clicked five times

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