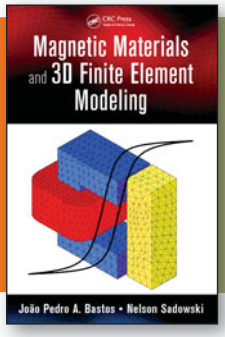


Magnetic Materials and 3D Finite Element Modeling

João Pedro A. Bastos
and Nelson Sadowski

CRC Press, 2013
382 pages, $119.96
ISBN 978-1-4665-9251-3

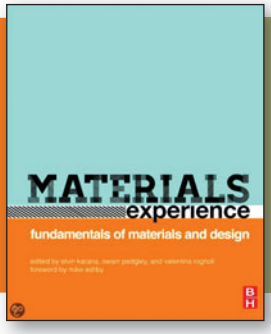
Finite element (FE) analysis has been widely used by engineers and researchers during the product development process of electromagnetic devices. For the design of the devices, both the modeling technique and precise description of the performance of the materials are essential, and both topics are covered in this book.

The book starts with Maxwell equations, which are the foundation for the topics that follow. From this point of view, the book aims primarily at graduate or senior undergraduate students who have taken introductory courses in electricity and magnetism and who have basic knowledge of vector analysis, linear algebra, and numerical analysis. The authors did excellent work to illustrate the equations. Relationships between different variables in the equations are presented with the help of simple schematic diagrams. The equations are explained in such a way that it is very easy for the readers to link them to the following FE calculation. For low-frequency applications, emphasized by the authors, permanent magnets and electrical steels are vital materials. Iron losses in electromagnetic devices are also addressed after a brief introduction to magnetic materials. Both experimental measurement procedure and theoretical hysteresis modeling (i.e., transition curve construction) are discussed. The latter is also essential for the following FE calculation.

Finite element modeling (FEM) is a broad topic. In this book, the authors focus on the Galerkin method, which is widely used in electromagnetism. Although the title of the book mentions three-dimensional (3D) finite element modeling, the authors introduce the fundamental concept and the method from 2D applications. The strategy here is similar to the way the Maxwell equations are presented, breaking down complex problems into smaller components. Fundamental concepts, such as Nodal elements, edge elements, shape functions, and coordinate transformations, are well explained. This approach provides a clear explanation for readers without any exposure to FEM. Simulation details are presented with original Fortran 77 codes. Most readers, especially beginners, may not need to write code, but writing computer programs is helpful to achieve a firm understanding of the underlying concept. The authors conclude the book with 3D magnetostatic and dynamic applications, a convenient way for readers to practice what they have learned in this book and to study the advanced topics in electromagnetic simulation.

Overall, this book is well organized and clearly written. However, the section on materials is too brief. In particular, typical permanent magnets are covered in less than one page, and recent developments of permanent magnets are not discussed. From this perspective, this book is more suitable for those who have expertise in magnetic materials and are seeking knowledge and skills in FE analysis.

***Reviewer: Wanfeng Li** is a research engineer in the Research & Advanced Engineering Department, Ford Motor Company, USA.*



Materials Experience: Fundamentals of Materials and Design

Editors: Elvin Karana, Owain Pedgley, and Valentina Rognoli

Butterworth-Heineman, 2013
400 pages, $69.95
ISBN 978-0-08-099359-1

This book gives an excellent introduction to a composition that reflects the fundamentals for turning a design idea into a materialized outcome. It provokes us to think more deeply about relationships we have with the materials of our world and how we could strengthen the materials and design arena.

The first section is concerned with the fundamentals of user experience. The contributing authors explore how people approach materials, how they sense them, how they attribute meanings to them, and how they build deeper relationships with them. The editors offer chapters on the role of materials in product experience, sensory pleasure, multisensory approaches that bring about materials experience, and universal and cultural meanings in relation to material aesthetics.

The second section discusses materials and design in relation to sustainability, covering the roles of materials and achieving social sustainability, emotionally durable design, and alternative design approaches, including designing with waste, design for imperfection, and graceful aging. The last chapter of this section presents a number of novel multipurpose materials with good environmental credentials.

In the third section on Technological Development in Materials and