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Autore	Rhodes R. A. W.
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Nota di contenuto	Front cover; PEM Fuel Cell Modeling and Simulation Using MATLAB®; Copyright page; Table of contents; Acknowledgments; CHAPTER 1: An Introduction to Fuel Cells; 1.1 Introduction; 1.2 What Is a Fuel Cell?; 1.3 Why Do We Need Fuel Cells?; 1.4 History of Fuel Cells; 1.5 Mathematical Models in the Literature; 1.6 Creating Mathematical Models; Chapter Summary; Problems; Bibliography; CHAPTER 2: Fuel Cell Thermodynamics; 2.1 Introduction; 2.2 Enthalpy; 2.3 Specific Heats; 2.4 Entropy; 2.5 Free Energy Change of a Chemical Reaction; 2.6 Fuel Cell Reversible and Net Output Voltage 2.7 Theoretical Fuel Cell EfficiencyChapter Summary; Problems; Bibliography; CHAPTER 3: Fuel Cell Electrochemistry; 3.1 Introduction; 3.2 Basic Electrokinetics Concepts; 3.3 Charge Transfer; 3.4 Activation Polarization for Charge Transfer Reactions; 3.5 Electrode Kinetics; 3.6 Voltage Losses; 3.7 Internal Currents and Crossover Currents; Chapter Summary; Problems; Bibliography; CHAPTER 4: Fuel Cell Charge Transport; 4.1 Introduction; 4.2 Voltage Loss Due to Charge Transport; 4.3 Electron Conductivity of Metals; 4.4 Ionic Conductivity of Polymer Electrolytes; Chapter Summary; Problems

BibliographyCHAPTER 5: Fuel Cell Mass Transport; 5.1 Introduction; 5.2 Fuel Cell Mass Balances; 5.3 Convective Mass Transport from Flow Channels to Electrode; 5.4 Diffusive Mass Transport in Electrodes; 5.5 Convective Mass Transport in Flow Field Plates; 5.6 Mass Transport Equations in the Literature; Chapter Summary; Problems; Bibliography; CHAPTER 6: Heat Transfer; 6.1 Introduction; 6.2 Basics of Heat Transfer; 6.3 Fuel Cell Energy Balances; 6.4 Fuel Cell Heat Management; Chapter Summary; Problems; Bibliography; CHAPTER 7: Modeling the Proton Exchange Structure; 7.1 Introduction
7.2 Physical Description of the Proton Exchange Membrane7.3 Types of Models; 7.4 Proton Exchange Membrane Modeling Example; Chapter Summary; Problems; Bibliography; CHAPTER 8: Modeling the Gas Diffusion Layers; 8.1 Introduction; 8.2 Physical Description of the Gas Diffusion Layer; 8.3 Basics of Modeling Porous Media; 8.4 Modes of Transport in Porous Media; 8.5 Types of Models; 8.6 GDL Modeling Example; Chapter Summary; Problems; Bibliography; CHAPTER 9: Modeling the Catalyst Layers; 9.1 Introduction; 9.2 Physical Description of the PEM Fuel Cell Catalyst Layers; 9.3 General Equations
9.4 Types of Models9.5 Heat Transport in the Catalyst Layers; Chapter Summary; Problems; Bibliography; CHAPTER 10: Modeling the Flow Field Plates; 10.1 Introduction; 10.2 Flow Field Plate Materials; 10.3 Flow Field Design; 10.4 Channel Shape, Dimensions, and Spacing; 10.5 Pressure Drop in Flow Channels; 10.6 Heat Transfer from the Plate Channels to the Gas; Chapter Summary; Problems; Bibliography; CHAPTER 11: Modeling Micro Fuel Cells; 11.1 Introduction; 11.2 Micro PEM Fuel Cells in the Literature; 11.3 Microfluidics; 11.4 Flow Rates and Pressures; 11.5 Bubbles and Particles
11.6 Capillary Effects

Sommario/riassunto

Although, the basic concept of a fuel cell is quite simple, creating new designs and optimizing their performance takes serious work and a mastery of several technical areas. PEM Fuel Cell Modeling and Simulation Using Matlab, provides design engineers and researchers with a valuable tool for understanding and overcoming barriers to designing and building the next generation of PEM Fuel Cells. With this book, engineers can test components and verify designs in the development phase, saving both time and money.Easy to read and understand, this book provides design and modelling tips for