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Nota di contenuto	Nonporous Inorganic Membranes; Contents; Preface; List of Contributors; 1 Dense Ceramic Membranes for Hydrogen Separation; 1.1 Introduction; 1.2 Applications and Principles of Operation; 1.2.1 Simple Cases; 1.2.2 Examples of More Complex Applications; 1.3 Defect Chemistry of Dense Hydrogen-permeable Ceramics; 1.3.1 Materials Classes; 1.3.2 Neutral and Ionized Hydrogen Species in Oxides; 1.3.4 Protonic Defects and Their Transport; 1.3.5 Defect Structures of Proton-conducting Oxides; 1.3.6 Diffusivity, Mobility and Conductivity: The Nernst-Einstein Relation 1.4 Wagner Transport Theory for Dense Ceramic Hydrogen-Separation Membranes1.4.1 General Expressions; 1.4.2 From Charged to Well-Defined Species: The Electrochemical Equilibrium; 1.4.3 The Voltage Over a Sample; 1.4.4 Flux of a Particular Species; 1.4.5 Fluxes in a Mixed Proton, Oxygen Ion, and Electron Conductor; 1.4.6 Fluxes in a Mixed Proton and Electron Conductor; 1.4.7 Fluxes in a Mixed Proton

and Oxygen Ion Conductor; 1.4.8 Fluxes in a Mixed Proton, Oxygen Ion, and Electron Conductor Revisited; 1.4.9 Permeation of Neutral Hydrogen Species; 1.4.10 What About Hydride Ions?
1.5 Surface Kinetics of Hydrogen Permeation in Mixed Proton-Electron Conductors1.6 Issues Regarding Metal Cation Transport in Hydrogen-permeable Membrane Materials; 1.7 Modeling Approaches; 1.8 Experimental Techniques and Challenges; 1.8.1 Investigation of Fundamental Materials Properties; 1.8.1.1 Concentration; 1.8.1.2 Diffusion; 1.8.1.3 Conductivity; 1.8.1.4 Transport Numbers; 1.8.1.5 Other Properties; 1.8.2 Investigation of Surface Kinetics; 1.8.3 Measurements and Interpretation of Hydrogen Permeation; 1.9 Hydrogen Permeation in Selected Systems; 1.9.1 A Few Words on Flux and Permeability
1.9.2 Classes of Membranes1.9.3 Mixed Proton-Electron Conducting Oxides; 1.9.4 Cermets; 1.9.5 Permeation in Other Oxide Classes and the Possibility of Neutral Hydrogen Species; 1.9.6 Comparison with Metals; 1.10 Summary; 2 Ceramic Proton Conductors; 2.1 Introduction; 2.2 General Properties of Perovskite-structured Proton-conducting Ceramic Membranes; 2.2.1 Creation of Protonic Carriers; 2.2.2 Transport Properties; 2.2.3 Electronic Conductivity and Its Improvement; 2.3 Synthesis of Proton-conducting Ceramic Membranes; 2.3.1 Synthesis of Powders
2.3.2 Effect of Synthesis Conditions on Membrane Performance2.3.3 Preparation of Thin Films; 2.4 Hydrogen Permeation; 2.4.1 The H(2) Permeation Set-up and Sealing System; 2.4.2 Effects of Process Variables on H(2) Flux; 2.4.2.1 Effect of Feed and Sweep Side Gas Concentrations; 2.4.2.2 Effect of Membrane Thickness; 2.4.2.3 Effect of Temperature; 2.4.3 Mathematical Models for Hydrogen Permeation; 2.5 Chemical Stability of Protonic Conductors; 2.5.1 Stability in CO(2) Atmospheres; 2.5.2 Stability in Moisture-containing Atmospheres; 2.5.3 Stability in Reducing Atmospheres
2.6 Future Directions and Perspectives

Sommario/riassunto

This reference book addresses the evolution of materials for both oxygen and hydrogen transport membranes and offers strategies for their fabrication as well as their subsequent incorporation into catalytic membrane reactors. Other chapters deal with, e.g., engineering design and scale-up issues, strategies for preparation of supported thin-film membranes, or interfacial kinetic and mass transfer issues. A must for materials scientists, chemists, chemical engineers and electrochemists interested in advanced chemical processing.