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Aerogels -- Sol-Gel Synthesis, Property Studies and Energy Applications -- 5.1 Overview of Epoxide Aerogels -- 5.1.1 History of Aerogels -- 5.1.2 Advantages of Epoxide-Assisted Approach -- 5.2 Synthesis and Drying Technique -- 5.2.1 Metal Salt Precursors for Aerogels -- 5.2.1.1 Selection of Precursors -- 5.2.1.2 Choice of Solvents -- 5.2.2 Hydrolysis -- 5.2.2.1 Hydrolysis in Aqueous Media: Formation of Hydroxo/Oxo Ligands -- 5.2.2.2 Hydrolysis in Organic Solvents -- 5.2.3 Epoxide-Assisted Gelation and Condensation -- 5.2.3.1 Olation Condensation -- 5.2.3.2 Oxolation Condensation.
5.2.4 Gel Drying -- 5.2.4.1 Supercritical Drying (SCD) -- 5.2.4.2 Freeze Drying -- 5.2.4.3 Ambient Pressure Drying -- 5.3 Epoxide-assisted Aerogels -- 5.3.1 Metal Oxides -- 5.3.1.1 Alumina Aerogels -- 5.3.1.2 Titania Aerogels -- 5.3.1.3 Vanadia Aerogels -- 5.3.1.4 Zirconia Aerogels -- 5.3.1.5 Other Oxide Aerogels -- 5.3.2 Composites Aerogels -- 5.3.2.1 Inorganic-inorganicComposites -- 5.3.2.2 Inorganic-OrganicComposites -- 5.4 Aerogels Properties and Characterization -- 5.4.1 Structural Characterization -- 5.4.1.1 X-rayDiffraction -- 5.4.1.2 Electron Microscopy -- 5.4.1.3 Infrared Spectroscopy -- 5.4.2 Mechanical Characterization -- 5.5 Some Applications and Examples -- 5.5.1 Catalysis -- 5.5.2 Solid Fuel Cell -- 5.5.3 Water Treatment -- 5.5.4 Biodiesel Production -- 5.5.5 Energy Conversion and Storage Applications -- 5.6 Summary -- References -- Chapter 6 CNT-Based Aerogels and Their Applications -- 6.1 Introduction -- 6.2 The Fundamental Principle of Preparing CNT-based Aerogels -- 6.3 Strategies for Preparation of CNT-based Aerogels -- 6.3.1 Preparation of CNT-based Aerogels via CVD -- 6.3.1.1 Isotropic CNT Aerogels -- 6.3.1.2 3D Vertical CNT Arrays -- 6.3.1.3 Template-assistedCNT-basedAerogels -- 6.3.2 Surface-modified CNT-based Aerogels -- 6.3.2.1 Preparation of Aerogels with Noncovalent Modified CNTs -- 6.3.2.2 Preparation of Aerogels with Covalent Modified CNTs -- 6.3.3 CNT Doping in 3D Aerogels -- 6.3.4 CNT/Inorganic Nanocrystal Composite Aerogels -- 6.4 Applications -- 6.4.1 Water Treatment -- 6.4.2 Energy Storage and Conversion -- 6.4.3 Catalysts -- 6.5 Conclusions and Perspectives -- References -- Chapter 7 Silica-Based Aerogels for Building Transparent Components -- 7.1 Introduction -- 7.2 Silica Aerogels Production -- 7.2.1 Preparation Steps -- 7.2.1.1 Precursors -- 7.2.1.2 Gel Preparation -- 7.2.1.3 Aging -- 7.2.1.4 Drying.
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Sommario/riassunto

This book, 'Aerogels for Energy Saving and Storage,' explores the advanced applications of aerogels in energy conservation and storage. Edited by Meldin Mathew, Hanna J. Maria, Ange Nzihou, and Sabu Thomas, it provides a comprehensive overview of the history, physical properties, and applications of aerogels. The book delves into various types of aerogels, including oxide-based, organic, and carbon-based, and discusses their synthesis, properties, and potential in energy-related applications such as batteries, fuel cells, and hydrogen storage. It aims to disseminate knowledge about the cutting-edge developments in aerogel technology and its role in sustainable energy solutions. The intended audience includes researchers, engineers, and professionals in the fields of materials science and energy technology.