1. Record Nr. UNINA9910141724903321

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Titolo	Hydrogen generation, storage, and utilization / / Jin Zhong Zhang [and three others]
Pubbl/distr/stampa	Hoboken, New Jersey : , : Wiley : , : ScienceWise Publishing, , 2014 ©2014
ISBN	1-5231-1082-1 1-118-87519-2 1-118-87517-6 1-118-87502-8
Descrizione fisica	1 online resource (226 p.)
Collana	A Wiley-Science Wise Co-Publication
Disciplina	665.8/1
Soggetti	Hydrogen - Storage Energy storage Hydrogen as fuel
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Cover; Title page; Copyright page; Contents; Preface; Acknowledgments; 1: Introduction to Basic Properties of Hydrogen; 1.1 Basics about THE Hydrogen Element; 1.2 Basics about the Hydrogen Molecule; 1.3 Other Fundamental Aspects of Hydrogen; 1.4 Safety and Precautions about Hydrogen; References; 2: Hydrocarbons for Hydrogen Generation; 2.1 Basics about Hydrocarbons; 2.2 Steam Methane Reforming; 2.3 Partial Oxidation; 2.4 Methanol and Ethanol Steam Reforming; 2.5 Glycerol Reforming; 2.5.1 Glycerol Reforming Processes; 2.5.2 Mechanistic Aspects of Glycerol Reforming Reactions 2.5.3 Catalytic Reforming of Glycerol2.6 Cracking of Ammonia and Methane; 2.6.1 Ammonia Cracking; 2.6.2 Methane Cracking; 2.6.3 Other Decomposition Methods; 2.7 Summary; References; 3: Solar Hydrogen Generation: Photocatalytic and Photoelectrochemical Methods; 3.1 Basics about Solar Water Splitting; 3.2 Photocatalyic Methods; 3.2.1 Background; 3.2.2 Metal Oxides; 3.2.3 Metal Oxynitrides/Metal Nitrides/Metal Phosphides; 3.2.4 Metal

Chalcogenides; 3.2.5 Conclusion; 3.3 Photoelectrochemical Methods; 3.3.1 Background; 3.3.2 Photocathode for Water Reduction; 3.3.3 Photoanode for Water Oxidation
3.3.4 Conclusion3.4 Summary; References; 4: Biohydrogen Generation and Other Methods; 4.1 Basics about Biohydrogen; 4.2 Pathways of Biohydrogen Production from Biomass; 4.3 Thermochemical Conversion of Biomass to Hydrogen; 4.3.1 Hydrogen from Biomass via Pyrolysis; 4.3.2 Hydrogen from Biomass via Gasification; 4.3.3 Hydrogen from Biomass via Supercritical Water (Fluid-Gas) Extraction; 4.3.4 Comparison of Thermochemical Processes; 4.4 Biological Process for Hydrogen Production; 4.4.1 Biophotolysis of Water Using Microalgae; 4.4.2 Photofermentation; 4.4.3 Dark Fermentation
4.4.4 Two-Stage Process: Integration of Dark and Photofermentation4.5 Summary; References; 5: Established Methods Based on Compression and Cryogenics; 5.1 Basic Issues about Hydrogen Storage; 5.2 High Pressure Compression; 5.3 Liquid Hydrogen; 5.4 Summary; References; 6: Chemical Storage Based on Metal Hydrides and Hydrocarbons; 6.1 Basics on Hydrogen Storage of Metal Hydrides; 6.2 Hydrogen Storage Characteristics of Metal Hydrides; 6.2.1 Storage Capacities; 6.2.2 Thermodynamics and Reversible Storage Capacity; 6.2.3 Hydrogenation and Dehydrogenation Kinetics; 6.2.4 Cycling Stability
6.2.5 Activation6.3 Different Metal Hydrides; 6.3.1 Binary Metal Hydrides; 6.3.2 Metal Alloy Hydrides; 6.3.3 Complex Metal Hydrides; 6.3.4 Improving Metal Hydride Performance; 6.4 Hydrocarbons for Hydrogen Storage; 6.4.1 Reaction between Carbon Atom and Hydrogen; 6.4.2 Reaction between Solid Carbon and Hydrogen; 6.4.3 Reaction between Carbon Dioxide and Hydrogen; 6.5 Summary; References; 7: Physical Storage Using Nanostructured and Porous Materials; 7.1 Physical Storage Using Nanostructures; 7.1.1 Carbon Nanostructures; 7.1.2 Other Nanostructures and Microstructures
7.2 Physical Storage Using Metal-Organic Frameworks

Sommario/riassunto

Addresses the three fundamental aspects of hydrogen as a fuel resource: generation, storage, and utilizationProvides theoretical basis for the chemical processes required for hydrogen generation, including solar, photoelectrochemical, thermochemical, and fermentation methodsDiscusses storage of hydrogen based on metal hydrides, hydrocarbons, high pressure compression, and cryogenicsExamines the applications of hydrogen utilization in the fields of petroleum, chemical, metallurgical, physics, and manufacturingContains over 90 figures, including 27 col

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Record Nr.	UNINA9910709920403321
Autore	Gilsinn David <1943->
Titolo	NBS minimal BASIC test programs - Version 1 user's manual : Volume 3 - control statements, data structure, program input / / David E. Gilsinn; Charles L. Sheppard
Pubbl/distr/stampa	Gaithersburg, MD : , : U.S. Dept. of Commerce, National Institute of Standards and Technology, , 1978
Descrizione fisica	1 online resource
Collana	NBSIR ; ; 78-1420-3
Altri autori (Persone)	GilsinnDavid <1943-> SheppardCharles L
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	1978. Contributed record: Metadata reviewed, not verified. Some fields updated by batch processes. Title from PDF title page.
Nota di bibliografia	Includes bibliographical references.