1. Record Nr. UNINA9910688584603321

Titolo	Functional materials based on metal hydrides / / edited by Torben R. Jensen [and three others]
Pubbl/distr/stampa	Basel, Switzerland : , : MDPI, , 2018
ISBN	3-03897-283-5
Descrizione fisica	1 online resource (180 pages)
Disciplina	546.2
Soggetti	Hydrides
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	About the Special Issue Editors -- Hai-Wen Li, Min Zhu, Craig Buckley and Torben R. Jensen Functional Materials Based on Metal Hydrides, Reprinted from: Inorganics 2018, 6, 91, doi: 10.3390 /inorganics6030091 -- Julian Puszkiel, Sebastiano Garroni, Chiara Milanese, Fabiana Gennari, Thomas Klassen, Martin Dornheim and Claudio Pistidda Tetrahydroborates: Development and Potential as Hydrogen Storage Medium Reprinted from: Inorganics 2017, 5, 74, doi: 10.3390/inorganics5040074 -- Juan Luis Carrillo-Bucio, Juan Rogelio Tena-Garcia and Karina Suarez-Alcantara Dehydrogenation of Surface-Oxidized Mixtures of 2LIBH + Al/Additives (TiF3 or CeO2), Reprinted from: Inorganics 2017, 5, 82, doi: 10.3390/inorganics5040082 -- Yuki Nakagawa, Shigehito Isobe, Takao Ohki and Naoyuki Hashimoto Unique Hydrogen Desorption Properties of LIAIH,/h-BN Composites, Reprinted from: Inorganics 2017, 5, 71, doi: 10.3390/inorganics5040071 -- Liuzhang Ouyang, Hao Zhong, Hai-Wen Li and Min Zhu A Recycling Hydrogen Supply System of NaBH, Based on a Facile Regeneration Process: A Review Reprinted from: Inorganics 2018, 6, 10, doi: 10.3390 /inorganics6010010 -- Michael Heere, Seyed Hosein Payandeh Gharib Doust, Matteo Brighi, Christoph Frommen, Magnus H. Sørby, Radovan Cerny, Torben R. Jensen and Bjørn C. Hauback Hydrogen Sorption in Erbium Borohydride Composite Mixtures with LIBH, and/or LiH Reprinted from: Inorganics 2017, 5, 31, doi: 10.3390 /inorganics5020031 -- Guanqiao Li, Motoaki Matsuo, Shigeyuki Takagi, Anna-Lisa Chaudhary, Toyoto Sato, Martin Dornheim and Shin-

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Sommario/riassunto

Our extreme and growing energy consumption, based on fossil fuels, has significantly increased the levels of carbon dioxide in the atmosphere, which may lead to global and irreversible climate changes. We have plenty of renewable energy, e.g., sun and wind, but the fluctuations over time and geography call for a range of new ideas and, possibly, novel technologies. The most difficult challenge appears to be the development of the efficient and reliable storage of renewable energy. Hydrogen has long been considered as a potential means of energy storage; however, storage of hydrogen is also challenging. Therefore, a wide range of hydrogen-containing materials, with energy-related functions, has been discovered over the past few decades. The chemistry of hydrogen is very diverse, and so also are the new hydrides that have been discovered, not only in terms of structure and composition but also in terms of their properties. This has led to a wide range of new possible applications of metal hydrides that permeate beyond solid-state hydrogen storage. A variety of new hydrides, proposed as battery materials, has been discovered. These can exploit properties as fast ion conductors or as conversion-type electrodes with much higher potential energy capacities, compared to materials currently used in commercial batteries. Solar heat storage is also an area of great potential for metal hydrides, in principle offering orders of magnitude better storage performance than phase change materials. Recently, hydrides with optical and superconducting properties have also been investigated. This Special Issue of Inorganics, entitled "Functional Materials Based on Metal Hydrides", is dedicated to the full range of emerging electronic, photonic, and energy-related, inorganic, hydrogen-containing materials.