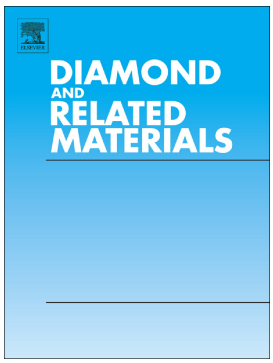

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PII: S0925-9635(17)30573-3
DOI: doi:10.1016/j.diamond.2017.12.003
Reference: DIAMAT 6981

To appear in: *Diamond & Related Materials*

Received date: 18 October 2017
Revised date: 28 November 2017
Accepted date: 4 December 2017

Please cite this article as: W. Liu, E. Setijadi, L. Crema, R. Bartali, N. Laidani, K.F. Aguey-Zinsou, G. Speranza , Carbon nanostructures/Mg hybrid materials for hydrogen storage. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Diamat(2017), doi:10.1016/j.diamond.2017.12.003

Carbon nanostructures / Mg hybrid materials for hydrogen storage

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Abstract

For achieving an economy based on renewable energy sources, effective solutions toward energy storage remain the main challenge. To date, there is no efficient systems to store electricity in large amounts. A promising solution is to accumulate energy in the form of hydrogen, which can then be conveniently stored and transported. However, compared to the volumetric energy density of fossil fuels, current technologies relying on hydrogen compression or liquefaction have major disadvantages, including low energy density and safety issues. The use of light materials forming hydrides could provide an alternative way to stock hydrogen with high volumetric energy densities. Herein, we present recent developments in the research for magnesium/graphene hybrid materials and their hydrogen-storage properties.

Keywords: magnesium hydride, graphene, hydrogen storage, nanosizing

Introduction

It is estimated that the world energy consumption will double by 2050.[1] The total emissions from energy consumption in 2015 estimated by US Environmental Protection Agency was 6,587 Million Metric Tons of CO_2 equivalent. The 35% of this huge amount of CO_2 is due to electricity production while the 32% to transports (the remaining part is 15% caused by industry, 10% residential and commercial, 7% combustion of non-fossil fuels).[2] The shortage of non-renewable fossil fuels (petroleum, coal, oil, gas) and the increasing widespread pollution call for developing new methods to produce, convert and store energy. Energy storage is considered as one of the most challenging objective for achieving an economy based on renewable energy sources. Among storage possibilities, hydrogen (H_2) is currently regarded as one of the most promising mean to store and carry energy. The energy