

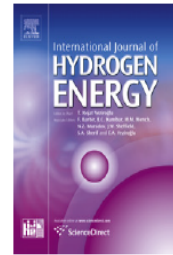


ELSEVIER

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

SciVerse ScienceDirect

journal homepage: [www.elsevier.com/locate/he](http://www.elsevier.com/locate/he)



## Sorption of hydrogen onto titanate nanotubes decorated with a nanostructured $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$ Prussian Blue analogue

A.A. Al-Hajjaj<sup>a</sup>, B. Zamora<sup>b</sup>, D.V. Bavykin<sup>a,\*</sup>, A.A. Shah<sup>a</sup>, F.C. Walsh<sup>a</sup>, E. Reguera<sup>b</sup>

<sup>a</sup>Energy Technology Research Group, School of Engineering Sciences, University of Southampton, Highfield, Southampton, SO17 1BJ, UK

<sup>b</sup>Centro de Investigacion en Ciencia Aplicada y Tecnologia Avanzada del IPN, Unidad Legaria, Legaria 694, Col. Irrigacion, Mexico

### ARTICLE INFO

#### Article history:

Received 17 June 2011

Received in revised form

30 August 2011

Accepted 19 September 2011

Available online 19 October 2011

#### Keywords:

Ferricyanide

Titanate nanotubes

Cadmium hexacyanoferrate

Hydrogen storage

High pressure

### ABSTRACT

Nanostructured films of cadmium hexacyanoferrate (III),  $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$  have been deposited on the surface of titanate nanotubes (TiNT) by ion exchange with  $\text{CdSO}_4$ , followed by reaction with  $\text{K}_3[\text{Fe}(\text{CN})_6]$  in an aqueous suspension. The composite demonstrates a significantly higher hydrogen storage uptake than pure  $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$  and TiNT. At a temperature of 77 K and a pressure 100 bar, the hydrogen uptake for the composite is approximately 12.5 wt %, whereas only 4.5 wt % and 4 wt % are achieved for the TiNT and  $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$  respectively. Electron microscopy and infrared spectroscopy show that  $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2$  is uniformly distributed on the surface of the nanotubes forming a discontinuous nanostructured film with a well developed interface, which allows efficient interaction with the support. The possible reasons for the high uptake of hydrogen in the composite are discussed.

Copyright © 2011, Hydrogen Energy Publications, LLC. Published by Elsevier Ltd. All rights reserved.