European Commission

Hydrogen - A Competitive Energy Storage Medium To Enable the Large Scale Integration of Renewable Energies

Seville, 15-16 November 2012

Hydrogen Storage Activities at HySA from (Nano)materials to Systems

Overall Objectives

One of HySA's missions is to deliver technologies for hydrogen storage infrastructure that meet the set cost targets and provide the best balance of safety, reliability, robustness, quality and functionality. HySA aims to develop storage and distribution strategies and new hydrogen storage materials that are practical and economical for various applications.

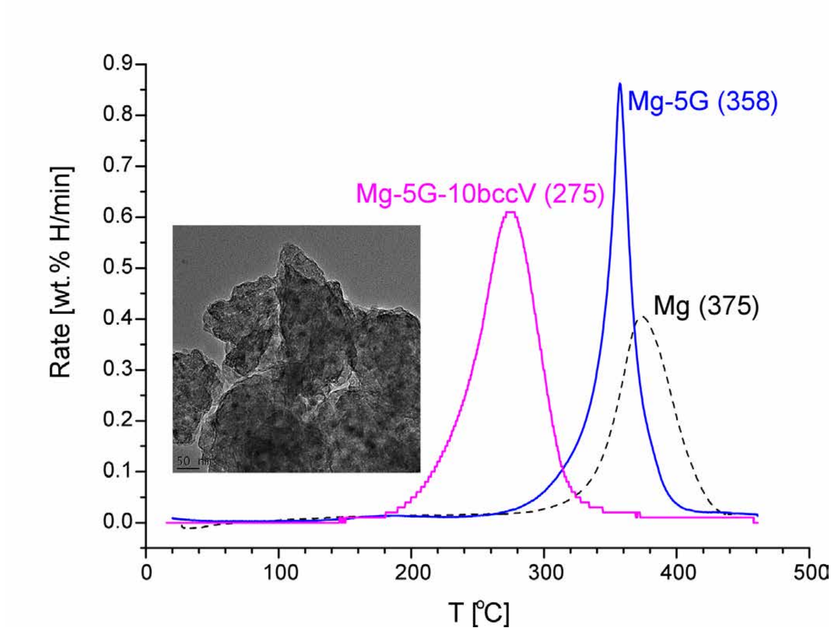
Add value to South African resources and improve the quality of life of all South Africans.

Technical Barriers and Targets

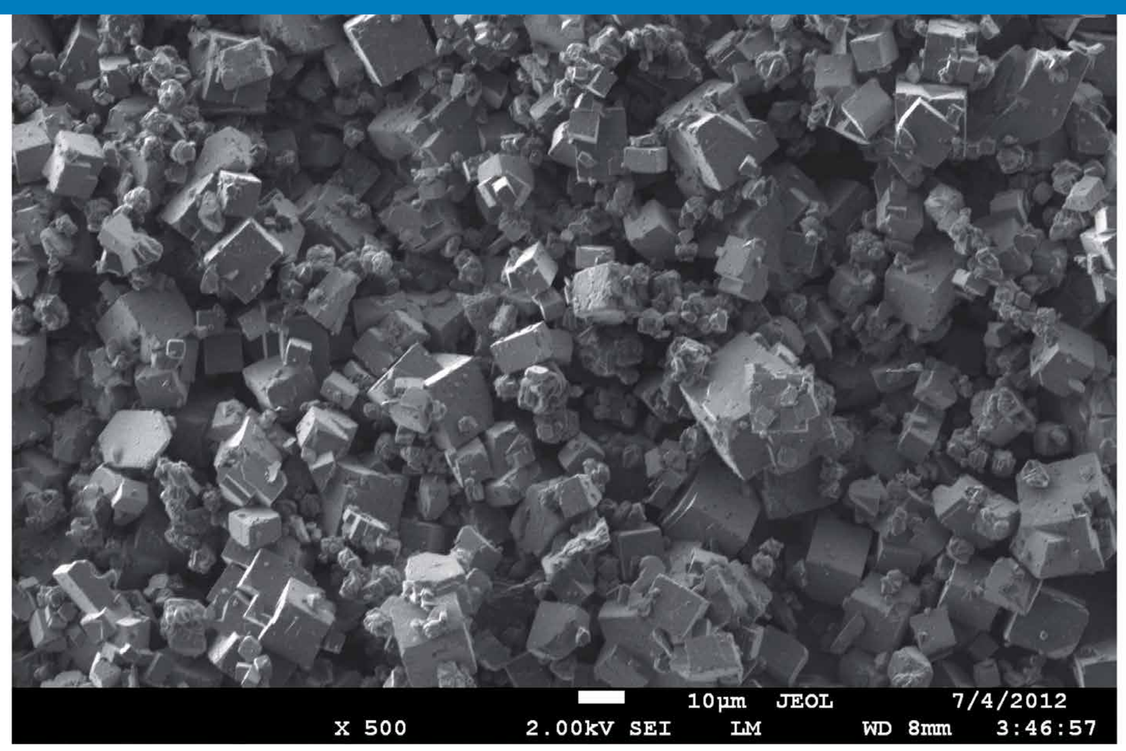
The challenges facing hydrogen storage for vehicles include ensuring a sufficient range, still within the constraints of weight, volume, efficiency, safety and cost. The targets set by US DOE (2015: 5.5 wt.% and 40 g/L) are adopted and are based on positioning hydrogen as a competitive option in the transport industry.

Scope of Hydrogen Storage Activities

Magnesium-based nanocomposites characterised by exceptional hydrogenation / dehydrogenation performances have been synthesised and characterised. Metal Organic Frameworks (MOFs) are being synthesised, modified and characterised. The use of carriers (e.g. NH_3) and the concept of transporting hydrogen as an easily decomposed chemical are being investigated. The HySA research portfolio also includes options of hydrogen storage using high pressure composite cylinders and tailored, PGM functionalised carbon nanostructures.



Dehydrogenation performances of Mg-M-C nanocomposites (M= bcc vanadium alloy; C= graphite) obtained by reactive ball milling in hydrogen. Inset shows TEM image of the material.



Scanning Electron Microscopy image of as-synthesised MOF-5

Progress and Accomplishments

A number of magnesium-based nanocomposites containing metallic and oxide catalysts with carbon additives have been prepared; their structure, morphology and hydrogen absorption – desorption performances were characterized. MOF-5 has also been successfully synthesised, modified and characterised, and work is underway to determine hydrogen storage performance.

Future Work

Future work is focused on establishing the best hydrogen storage material for further development, demonstration and commercialisation.

Project Overview

- Dr. Henrietta Langmi, Brian North, Dr. Dmitri Bessarabov, HySA Infrastructure Competence Centre, Dmitri.Bessarabov@nwu.ac.za, Dr. Mykhaylo Lototskyy, Dr. Mario Williams, Prof. Bruno G. Pollet, HySA Systems Competence Centre, bgpollet@hysasystems.org
- Council for Scientific and Industrial Research - North West University - University of the Western Cape

- 04/11 to 03/16
- www.hysainfrastructure.org - www.hysasystems.org

science & technology
Department: Science and Technology
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