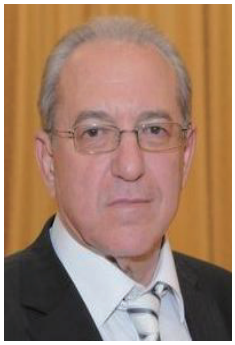
SEMINAR SERIES

International Institute for Carbon-Neutral Energy Research
Kyushu University

Title **Hydrogen Embrittlement in Structural Materials and Hydrogen Storage in Glass Structures**



Speaker Professor Dan Eliezer
Ben Gurion University, Israel

Date & Time Friday, February 17, 2012 4:00 p.m.

Place INAMORI Hall, Ito campus, Kyushu University

Abstract

Hydrogen embrittlement (HE) or hydrogen-assisted cracking are the most commonly used terms to describe sub-critical cracking due to hydrogen in materials. The role of traps is salient to a deeper understanding of the mechanism of HE. Thermal desorption spectroscopy is a very sensitive and accurate technique for studying hydrogen's diffusion and trapping processes in structural materials. The technique involves accurate measurement of the desorption rate of gas atoms, saluted or trapped in the materials, while heating the sample at a known rate. This presentation reviews the TDS application in different structural materials with an emphasis on a variety of titanium alloys, supermartensitic, duplex and stainless steels alloys.

A comprehensive knowledge of hydrogen-trapping interaction is necessary to decide whether or not a trap site influences safe service conditions. Hydrogen absorption/desorption processes were also investigated by using a high energy synchrotron radiation. This presentation assesses the hydrogen evolution and trapping parameters within the context of the various microstructures of the studied alloys as well as the correlation between prior microstructure, hydrogen concentration, potential trapping states and the alloy's response to hydrogen embrittlement.

The second part of the presentation will describe a new technology that we developed at BAM (Germany) that is based on capillary arrays which can ensure the safe storage of hydrogen of up to 200 MPa. A series of tests on single and multiple capillaries made of different glass materials has concluded that borosilicate capillaries have the highest burst pressure. The presentation will further detail the theoretical analysis as well as the experiment results of hydrogen storage in glass structures.

About the Speaker

Dan Eliezer was educated at the Technion Institute of Technology in Israel where he received a B.Sc. in Physics in 1969, M.Sc. in Materials Engineering in 1971 and the Doctor of Science in 1975. He was a Research Associate at University of Illinois at Urbana-Champaign between 1975 and 1977. From 1977 to 1978, he joined the NASA-AMES Research Center as an Associate. From 1984 to 1986, he was a National Research Council Senior Associate at the Air Force Base in Dayton, Ohio. He became the Head the Department of Materials Engineering at Ben Gurion University in Beersheva, Israel in 1986 until 1990 and again in 2000 until 2005. In 2005, he was a Senior Visiting Scientist at BAM, the Federal Institute for Materials Research & Testing in Berlin, Germany. In addition to his position at Ben Gurion University, he acts as Vice President and Chief Scientist for C.En Technology Ltd., which develops technology for hydrogen storage in glass structures.

Host Professor Yukitaka MURAKAMI

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