Project Report

Application No. 2001
Short title Raman spectroscopy on MgHx nanoparticles produced by spark discharge generation

Objectives: short, medium and long term (<250 words)

The main objective for these measurements was to understand the binding of hydrogen to magnesium. This study could provide some insight in the mechanism of the hydrogenation and dehydrogenation of the samples. This will allow us to better tailor the materials we produce to be most efficient with hydrogen sorption reactions.

Brief summary of work carried out:

A series of six samples of MgHx synthesized in different mixtures of argon and hydrogen plus two magnesium hydride reference samples have been used to measure Raman and infra red spectra. The Raman spectra could only be measured for the commercial MgH2 reference sample. The nanosized samples did not show any signal above the noise level. Dr. Borgshulte suggested that cooling the sample (~230K) during measurement will increase the signal. Even at low temperature the signal was very low, practically indistiguishable from the background level. However, during the cooling the window of the sample holder became very brittle and it broke during the removal of the sample.
In parallel to the Raman measurements, Inrared measurements were successfully performed. The results obtained show very interesting effects due to the atmosphere in which the material is synthesized.

Main achievements intended for publication <250 words

Though the Raman measurements did not provide any useful data, the infrared measurements show very interesting effects in the samples.
The absence of an -OH band in the structure is a very encouraging result that the samples do not contain Mg(OH)2.
For the samples that in XRD patterns are crystalline, the normal vibration spectrum of MgH2 is found while for the sample that appears to be amorphous in XRD, different bands are measured. The presence of vibration bands is an indication of a not completely random structure. We suspect it is an intermediate state between Mg metal and the hydride.
The results obtained will be included in a manuscript of a paper that is now being written.

Difficulties encountered <250 words

Raman measurements did not show any signal for the nanostructured MgH2 as we initially expected.
The low temperature measurements (230K) have lead to the breaking of the air tight sample holder.

Further comments: