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In-situ scattering experiment and structural analysis of hydrogen storage materials by high intensity neutron total diffractometer (NOVA)

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A high intensity neutron total diffractometer, NOVA, at J-PARC realizes new opportunity to study atomic distribution in various materials. Short time and small sample measurements are feasible for averaged structure analysis, and the real space resolution is enough for local structure (Pair Distribution Function) analysis. Crystalline structure as well as amorphous and liquid structure was investigated by NOVA for AlD_3, LaDx and $LiAl(ND_2)_4$. Also, time-transient measurement during hydrogen absorption and desorption process under hydrogen/deuterium gas atmosphere (max 10 MPa) is performed on NOVA, using a tight cell made from single crystal sapphire. The diffraction profiles of powder samples in the tight cell are obtained by removing the Bragg peaks of the single crystal sapphire. Absorption was carried out by submitting Pd powder to a deuterium pressure of 2 MPa at 393 K and letting it absorb with its own kinetics in quasi-equilibrium conditions. The time-divided neutron diffraction profiles during the deuterium absorption reaction revealed that the phase continuously transforms from metal Pd through alpha-PdDx to beta-PdD~0.7 in a few seconds. Some of recent results for structural study of promising hydrogen storage materials on NOVA will be presented.

Biography

Kazutaka Ikeda received his PhD from Tohoku University in 2006. During his PhD and Postdoctoral studies at Institute for Materials Research, Tohoku University, he was also a Research Fellow for young scientists of the Japan Society for the Promotion of Science. After serving as an Assistant Professor at the same institute, he moved to Institute of Materials Structure Science, High Energy Accelerator Research Organization (KEK) as a Research Associate Professor. His current research interests include material design of hydrogen storage materials and structural study by comprehensive use of multi-probes such as high intensity neutrons and synchrotron light.

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Notes: