Phase Transitions in Metal Hydrides by *in-situ* Synchrotron Powder Diffraction with High Time-resolution

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In-situ powder diffraction studies of hydrogen absorption/desorption in intermetallic compounds can offer valuable information about their real behaviour. The availability of the microstrip detector at the Materials Science Beamline at the Swiss Light Source, able to collect one full high resolution powder pattern in a very short time (~ 5 seconds), has allowed to follow hydrogen absorption/desorption in a sample in one shot.

A reaction tight cell rated up to 25 bar hydrogen pressure has been especially designed and built. Examples of *in-situ* studies on hydrogen absorbing intermetallic compounds like $LaNi_5$ will be shown. Analysis of the collected diffraction patterns has allowed obtaining the nature and amount of the phases involved during the hydrogen absorption/desorption, the evolution of the lattice parameters, and the anisotropic character of the diffraction line broadening. From these data, the out-of-equilibrium phases have been observed.

Temperature and/or hydrogen desorption induced phase transitions in selected light metal hydrides like $NaAlH_4$, $LiBH_4$ were studied in high-temperature chamber Stoe. High angular resolution of the experimental set-up has allowed characterization of lattice defects involved in the phase transitions.

Examples of hydride structure solution by direct space method (program FOX) will be shown too.

Keywords: metal hydride, time resolved study, powder diffraction