

High Pressure Workshop



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Towards neutron diffraction of high-pressure hydrides

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Hydrogen is an elusive atom and detecting it with X-ray diffraction techniques is nearly impossible, especially when it is incorporated in heavy atom matrices, as in many inorganic materials. In high pressure research, using neutrons to probe hydrogen positions is challenging as neutron sources have low flux, relative to synchrotrons, and pressure generation requires small samples. At the same time, there is active interest in structural hydrogen in several fields, including solid-state physics. Recent theoretical work in superconducting hydrides has focused on systems that are stable at lower pressures, achievable in the SNAP diamond anvil cell. This includes systems such as metallic borohydrides like K-doped CaB_2H_4 as well as ternary hydrides like Mg_2IrH_6 . Several compounds are predicted to have a stability field well within what is possible to probe using neutron diffraction.

In this talk we will show the feasibility of measuring hydride structures at high pressures using diamond anvil cells at the time-of-flight diffractometer SNAP, using MgH_2 as a model system. We will discuss the use of hydrogen donors and laser heating as a route to in-situ synthesis of the target materials and address the challenges that come with it.

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