Raman studies on hydrides

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A crucial part of this research effort is the accurate identification of the phase(s) present using a combination techniques, such as x-ray diffraction and vibrational spectroscopy (Raman and Infrared), to provide information on the crystal structure and local bonding environment. Raman spectroscopy has a number of advantages for the study of hydrogen storage materials, especially complex hydrides. Sensitivity to both crystalline and amorphous materials, and the ability to follow a reaction across a change of state, from solid to liquid or liquid to gas (and *vice versa*).

Raman and Infrared probe the bonding between the elements and with the appropriate experimental setup (e.g. Raman microscopy), can investigate reactions that have a large volume change (such as foaming) and involve the transition between states of matter and degrees of crystallinity.

Raman has been successfully used to help identify phases (particularly amorphous) within decomposed borohydride compounds. In situ measurements combine varying temperature and pressure with the collection of Raman spectra. The ability to track reactions and nucleation sites has a huge impact on controlling and tailoring complex hydride systems. Beyond measuring thermal decomposition variable temperature Raman spectroscopy can offer and insight into the dynamics of the system, indicating the degree of mobility within the structure.