XRS study of metal hydride nanocomposites for energy storage applications

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Efficient energy storage is crucial for the use of renewable energy from intermittent sources such as solar and wind. Metal hydride based nanocomposites (e.g. $LiBH_4$/C and $LiBH_4$/SiO_2) have attracted attention as a multifunctional materials for a variety of energy storage applications, including reversible hydrogen storage, rechargeable batteries, ammonia storage/decomposition.[1-6] Characterization of metal hydride nanocomposites is often hampered by their lack of long range crystallinity, the presence of mostly light (low Z) elements, and low concentration of the active phase(s). In this presentation, I will use examples from reversible hydrogen storage and all-solid-state batteries to demonstrate the efficacy of X-ray Raman Scattering (XRS) for the ex-situ and in-situ study of metal hydride nanocomposite materials in energy storage applications.[7-8] I will show that XRS is particularly ideal for probing the electronic (K and/or L edges) and structural changes in light elements such as Li, B, Ca, Na, Mg, N, K, Al, O and Si) which are often the main contents of metal hydride nanocomposites. I will discuss some of the experimental and challenges, and the effort to solve them.

References

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