Optimizing Hydrogen Storage by Doping the LiBH$_4$+MgH$_2$ Reaction with Various Niobium Based Oxides

PAUL HORNUNG, ROBERT WALKO, ANDREW WENZEL, RICHARD WRIGHT, TABBETHA DOBBINS, Rowan University, Dept. of Physics Astronomy — In this study, the effects of doping the dehydrogenation reaction of MgH$_2$ + 2LiBH$_4$ was combined with 5 mole% of three different Niobium based oxides (Nb$_2$O$_5$, NbO$_2$, and LiNbO$_3$). The compounds were mixed using high energy ball milling, and then heated using an air tight heating stage. We looked for changes in the Raman spectra as temperature increased (up to 350°C) as an indication of hydrogen desorption reaction. We found that milled LiBH$_4$ undergoes significant changes in Raman spectra during heating to 130°C. MgH$_2$ undergoes significant changes when comparing before and after milling—but in each case, the spectral peaks remain unchanged during heating to 350°C. The sample with LiNbO$_3$ exhibited a concrete change in Raman spectrum at 300°C while the sample doped with Nb$_2$O$_5$ underwent a change in spectra at 170°C. The sample doped with NbO$_2$ showed little change in spectra when the samples were heated up to 350°C. Further studies are underway to examine the nature of the changes in the Raman spectra using X-ray diffraction and residual gas analysis.