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Cryo-Milling and the Hydrogen Storage Properties of NaAlH4
KEVIN FELLER, TABBETHA DOBBINS, Rowan University — High energy ball milling of metal hydrides is a common way to both introduce catalysts (e.g. TiCl3) and to simultaneously increase the surface area. Both catalysis and increased surface area improve hydrogen storage capacity of the material. Nanostructuring of hydrides by depositing them into mesoporous templates (such as anodized alumina, MOFs, and SBA-15) has become a common way to increase surface area. However, the mesoporous template does not add hydrogen storage capacity—and thus, tends to decreased overall storage weight percent for the nanostructured hydride material. As with most materials, hydrides become brittle at low temperatures and will tend to fracture more readily. We will process Sodium Aluminum Hydride (NaAlH4) using cryogenic high energy ball milling using an in-house modified chamber SPEX Certiprep M8000 mixer/mill in order to gain a nanostructured hydride without mesoporous template material. Details of the modified mixer mill design will be presented. Ultimately, our planned future work is to study the resultant material using x-ray diffraction (Scherrer method for crystallite size), absorption/desorption temperature programmed desorption (TPD), and ultrasmall-angle x-ray scattering (USAXS) microstructural quantification to understand the role of cryomilling on enhancing the material's ability to store (and release) hydrogen.

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