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**Investigation of the Microstructure of Ti-Doped Sodium Aluminum Hydride.** Martin Sulic, Craig Jensen, Lance Culnane, Bjorn Hauback, Hendrick Brinks, Mark Pitt, Ian Robertson, Chemistry, Univ. of Hawaii, 2545 McCarthy Mall, Honolulu, HI 06822 USA.

It has been found that both doping and cycling of Ti-doped NaAlH<sub>4</sub> result in a decrease the crystal domain size and an increase anisotropic strain (Gomes, Renaudin, Hagemann, Yvon, Sulic, and Jensen, J. Alloys and Compd., 390, 2005, 305). In order to further elucidate the relationship between the microstructure of the hydride and kinetics of its reversible dehydrogenation, we have conducted X-ray and neutron diffraction studies in tandem with tunneling electron microscopy. In previous studies of Ti-doped NaAlH<sub>4</sub>, we found that Ti-dopant undergo a progression of metamorphoses during the early cycles of dehydrogenation and re-hydrogenation. Therefore, unlike earlier structural investigations, the present study was focused on materials that had been subjected to multiple cycles. Our results have provided new insights the connection between the Ti-dopants and the microstructure of the hydride. The details of our studies will be presented and discussed in terms of their implications on the mechanism of hydrogen cycling in the doped hydride.