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Doping of AlH_3 with alkali metal hydrides for enhanced decomposition kinetics GARY SANDROCK, Contractor to DOE Sandia National Labs, JAMES REILLY, JASON GRAETZ, WEI-MIN ZHOU, JOHN JOHNSON, JAMES WEGRZYN, Brookhaven National Lab — Aluminum hydride, AlH_3, has inherently high gravimetric and volumetric properties for onboard vehiclular hydrogen storage (10 wt% H_2 and 0.148 kg H_2/L). Yet it has been widely neglected because of its kinetic limitations for low-temperature H_2 desorption and the thermodynamic difficulties associated with recharging. This paper considers a scenario whereby doped AlH_3 is decomposed onboard and recharged offboard. In particular, we show that particle size control and doping with small levels of alkali metal hydrides (e.g., LiH) results in accelerated H_2 desorption rates nearly high enough to supply fuel-cell and ICE vehicles. The mechanism of enhanced H_2 desorption is associated with the formation of alanate windows (e.g., $LiAlH_4$) between the AlH_3 particles and the external gas phase. These alanate windows can be doped with Ti to further enhance transparency, even to the point of accomplishing slow decomposition of AlH_3 at room temperature. It is highly likely 2010 gravimetric and volumetric vehicular system targets (6 wt% H_2 and 0.045 kg/L) can be met with AlH_3. But a new, low-cost method of offboard regeneration of spent Al back to AlH_3 is yet needed.

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