

Supporting Information

Table S1. Possible reactions taking place at the various temperatures and the respective H₂ capacities. These reactions are determined according to the Li-Al phase diagram.

Temperature	Reaction	wt.% H ₂
506	$2 \text{LiH} + 3.23\text{Li}_{0.126}\text{Al}_{0.874} \rightarrow 5.23\text{Li}_{0.46}\text{Al}_{0.54} + \text{H}_2$	2.12
540	$2 \text{LiH} + 3.28\text{Li}_{0.131}\text{Al}_{0.869} \rightarrow 5.28\text{Li}_{0.46}\text{Al}_{0.54} + \text{H}_2$	2.10
560	$2 \text{LiH} + 3.40\text{Li}_{0.142}\text{Al}_{0.858} \rightarrow 5.40\text{Li}_{0.46}\text{Al}_{0.54} + \text{H}_2$	2.06
573	$2 \text{LiH} + 3.42\text{Li}_{0.144}\text{Al}_{0.856} \rightarrow 5.42\text{Li}_{0.46}\text{Al}_{0.54} + \text{H}_2$	2.05
585	$2 \text{LiH} + 3.48\text{Li}_{0.150}\text{Al}_{0.850} \rightarrow 5.48\text{Li}_{0.46}\text{Al}_{0.54} + \text{H}_2$	2.03

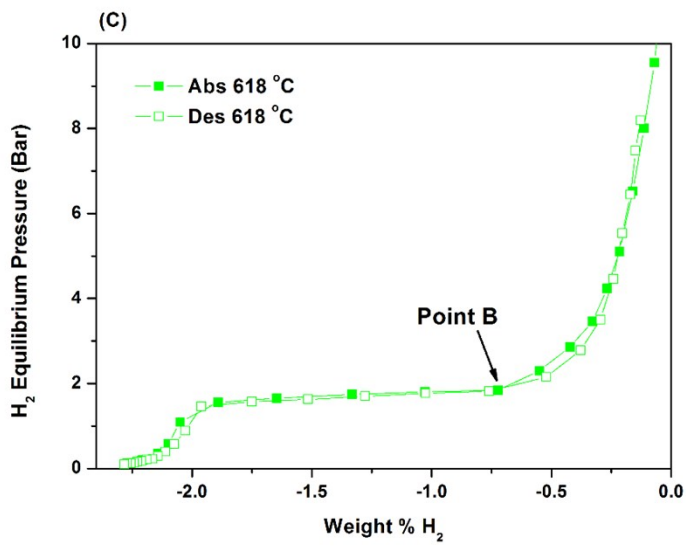
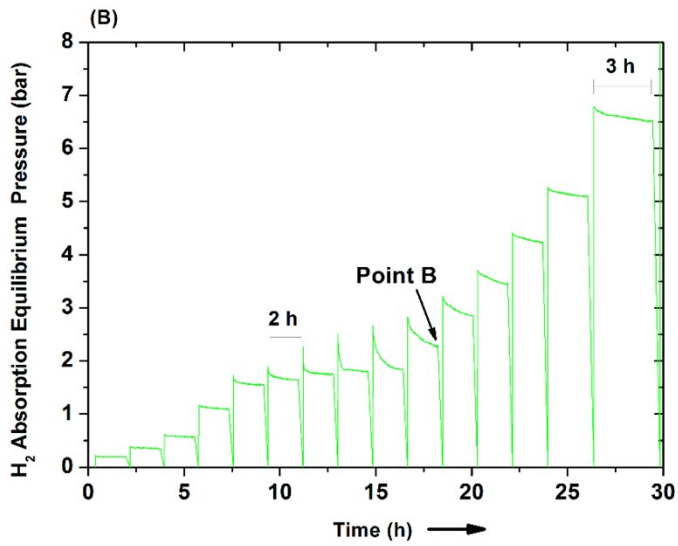
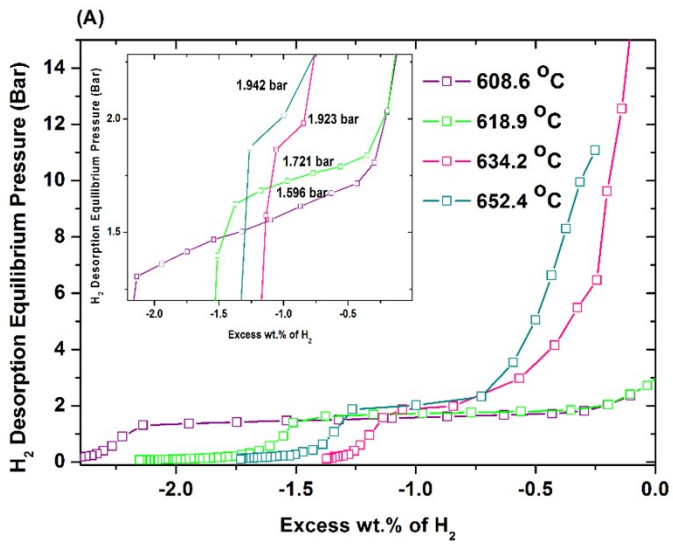


Figure S1. (A) Hydrogen desorption pressure – composition isotherms for reaction (2) performed at various temperatures above 600 °C. Hydrogen desorption equilibrium data below ~2.5 wt.% desorption has been displayed, and the inset of the figure provides the apparent equilibrium pressures. (B) Kinetic H₂ absorption data performed at 617.8 °C. (C) Desorption PCI followed by an absorption PCI performed at 617.8 °C. The slight hysteresis between the two curves either side of the plateau is the result of slow kinetics.

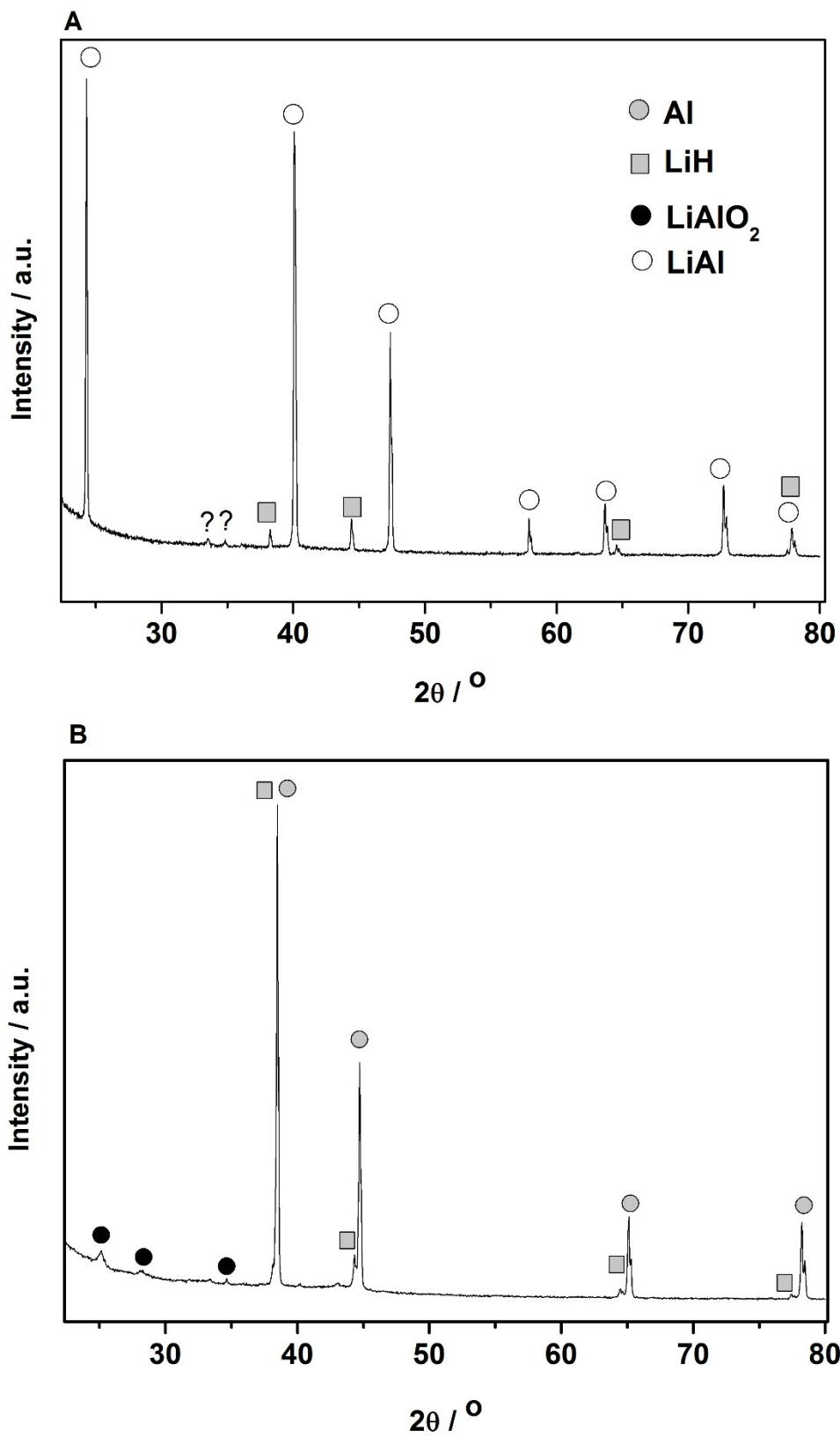


Figure S2 Powder X-ray diffraction pattern of the Li-Al-H sample after dehydrogenation at 618 °C (A) and after rehydrogenation (B).