

Improved Hydrogen Sorption Kinetics of NaAlH₄ by Synergistic Effects of Nanoconfinement and Nitrogen Doping

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For safe and feasible use of hydrogen fuel, solid-state hydrogen storage is one of the key solutions. Especially, complex hydride such as NaAlH₄ is a promising candidate which shows a high storage capacity; however, it can be employed only under high temperature and pressure condition with low reversibility due to thermodynamic and kinetic barriers, limiting practical applications. To resolve such issues, complex hydrides are confined into scaffolds such as porous carbon or doped with hetero-elements to form a composite, expecting improved storage properties through thermodynamically altered pathway, reduced diffusion path, and catalytic effects. We prepared nanoconfined NaAlH₄ into the nitrogen-doped porous carbon structure to enhance hydrogen sorption kinetics. The NaAlH₄ composite shows the lowest activation energy for dehydrogenation, ascribed to the synergistic effect of nanosized NaAlH₄ and charge donation from doped-nitrogen in the carbon scaffold. This strategy can be adapted into other hydrides system with the coming of hydrogen economy.