Effective hydrolysis of sodium borohydride driven by self-supported cobalt oxide nanorod array for on-demand hydrogen generation

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Abstract

Hydrogen storage, distribution and controlled release are of important concerns for hydrogen based economy. Sodium borohydride (NaBH4) is one of the mostly studied chemical hydrides used for'hydrogen storage and generation. However, it requires efficient catalysts to accelerate its dehydrogenation for controllable hydrogen production. In this paper, we demonstrate that the dehydrogenation of NaBH4 in alkaline solutions can be driven by self-supported cobalt oxide nanorod array on Ti sheet (Co3O4 NA/Ti). Such Co3O4 NA/Ti shows high catalytic performance with a maximum hydrogen generation rate of 1940 mL/min/g(Co3O4) and an activation energy of 59.84 kJ/mol under ambient condition. Moreover, this catalyst exhibits no mass or activity loss even after 5 cycles with an obvious advantage of easy separation from the fuel solution. This development offers us a cost-effective and recyclable catalytic material toward hydrolytic hydrogen production for applications.

Keywords

Author Keywords: Cobalt oxide; Nanorod array; On-demand hydrogen generation; Sodium borohydride hydrolysis; Catalyst

KeyWords Plus: CO-B CATALYST; AMMONIA-BORANE; NABH4 SOLUTION; FUEL-CELLS; NANOPARTICLES; NANOCLUSTERS; NANOCRYSTALS; REDUCTION; EVOLUTION; PRECURSOR

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