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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. (C) 2016 Elsevier B.V. All rights reserved.

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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