

# Hydrogen Production of Ammonia Borane by Using Ni-Co/r-GO Catalysts

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Nowadays, the energy consumption and the emission of carbon dioxide increased in the worldwide. Hence, the research of renewable energy attracts more and more attention in recent years. Among various green energies, hydrogen is one of the most promising energy resources because of its high efficiency, power density, and especially its low environmental effect. In general, there are four hydrogen storage methods: high-pressure tanks, liquefied hydrogen, metal hydrides and chemical hydrides. Chemical hydrides not only have higher hydrogen energy density but also produce hydrogen quickly in the presence of adequate catalysts. Ammonia borane ( $\text{NH}_3\text{BH}_3$ ) is a prospective compounds and the hydrogen energy density of  $\text{NH}_3\text{BH}_3$  is 19.6 wt%. Furthermore,  $\text{NH}_3\text{BH}_3$  and its spent products are rarely toxic and flammable. Graphene oxide (GO), one of carbon derivative, is popular support in recent years due to high surface areas (theoretical specific surface are of  $2600 \text{ m}^2/\text{g}$ ), excellent electric conductivity, superior mechanical strength and thermal stability. Hereafter, Ni-Co/r-GO catalysts were prepared by reducing Ni and Co particles on reduced graphene oxide (r-GO) nanosheets by using electroless deposition method. Ni-Co/r-GO catalysts were then sent for some modern techniques: SEM, EDS, TEM, VSM and ICP-AES.

In this work, hydrolysis of ammonia borane in the presence of Ni-Co/r-GO catalysts under adequate water dosage was studied to increase hydrogen energy density. Hydrogen and temperature profiles were observed by a mass flow meter (MFM) and a thermocouple, respectively. Additionally, parameters such as the amount of water dosage and the loadings of as-prepared catalysts were discussed.

Keywords: Hydrogen, Chemical Hydride, Ammonia Borane, Graphene Oxide, Hydrolysis Reaction.

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