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A COMPARATIVE STUDY FOR SODIUM BOROHYDRIDE DEHYDROGENATION AND ELECTROOXIDATION ON CERIUM AND COBALT CATALYSTS

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ABSTRACT

In the present study, Co/CNT and Ce/CNT catalysts are prepared via sodium borohydride (NaBH₄) reduction method. Co/CNT and Ce/CNT catalysts are examined to the dehydrogenation and electrooxidation of NaBH₄. NaBH₄ dehydrogenation activities of these Co/CNT and Ce/CNT catalysts are performed in alkaline environment. 5% Co/CNT catalyst exhibits superior hydrogen evolution compared with other catalysts. Activation energy is calculated using Arrhenius equation. Initial rate for this catalyst is found as 1700 ml H₂ g⁻¹_{cat} min⁻¹. As a result of the kinetic calculations, the activation energy of the catalyst is calculated as 44,68775 kJ/mol. The degree of reaction (n) is found to be 0.5 by trial and error. In conclusion, 5% Co/CNT catalyst is a promising catalyst for hydrogen production from NaBH₄. Cyclic voltammetry (CV) analysis is utilized to examine the electrochemical activity of the catalysts for NaBH₄ electrooxidation. 0.1% Co/CNT catalyst has 0.38 mA cm⁻² (3181 mA mg⁻¹ Co) specific activity.

Keywords: Dehydrogenation, electrooxidation, Ce, Co, Sodium borohydride