Methanol Electrooxidation Reaction in Alkaline Medium on Glassy Carbon Electrode Modified with Ordered Mesoporous Ni/Al₂O₃

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In this work, ordered mesoporous Ni/Al₂O₃ catalysts were prepared by the solvent evaporation induced self-assembly (EISA) method. The synthesized Ni/Al₂O₃ catalysts were characterized by XRD, elemental distribution analyses, N₂ adsorption and TEM. Ni/Al₂O₃ modified glassy carbon electrode was used to investigate the electrocatalytic oxidation of methanol in 0.1 M NaOH solution by cyclic voltammetry (CV) and chronoamperometry (CA). CVs results showed good electrocatalytic activity of Ni/Al₂O₃ for methanol electrooxidation in alkaline electrolytes. The good methanol electrooxidation activity of Ni/Al₂O₃ could be attributed to its synergetic effects between high dispersion of nickel and the ordered mesoporous structure that facilitates the diffusion of methanol and products. The CV and CA results suggest methanol electrooxidation is an irreversible process and a diffusion controlled process. The rate constant for the catalytic reaction of methanol is calculated to be $1.66 \times 10^6 \text{ cm}^3 \text{ mol}^{-1} \text{ s}^{-1}$.

Keywords: Methanol Electrooxidation, Glassy Carbon Electrode, Direct Methanol Fuel Cell, Alkaline Medium

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