SODIUM BOROHYDRIDE OXIDATION ON NiZn/Ti AND Au(NiZn)/Ti ELECTROCATALYSTS IN ALKALINE FUEL CELLS FOR CLEAN ENERGY CONSERVATION

Tripura Ganti[1], Aldona Balčiūnaitė[1], Huma Amber[1], Giedrius Stalnionis[1], Jūrate Vaičiūnienė[1], Loreta Tamašauskaitė-Tamašiūnaitė[1], Eugenijus Norkus[1]

[1]Center for Physical Sciences and Technology (FTMC), Department of Catalysis, 10257,Vilnius, Lithuania.
tripura.ganti@ftmc.lt

The development of efficient anode electrocatalysts is critical for enhancing the sodium borohydride oxidation reaction (BOR) in fuel cells. In this study, NiZn/Ti electrodes and Au-modified NiZn/Ti electrocatalysts were fabricated by electrodeposition of a NiZn layer on Ti, followed by alkaline leaching and galvanic deposition of Au nanocrystallites. Alkaline leaching generated dendritic surface architectures, while subsequent Au decoration introduced enhanced surface heterogeneity, improving access to reactive surface regions. The Au loading was measured as 19.25 μg cm-2. The electrochemical performance of the resulting electrocatalysts was evaluated in alkaline media containing sodium borohydride at concentrations ranging from 0.01 to 0.05 M using cyclic voltammetry and chronoamperometry. The Au-modified electrode exhibited higher BOR activity compared to bare NiZn/Ti, even at low Au loadings. Increasing the sodium borohydride concentration led to higher current densities, accompanied by a slight positive shift in peak potential. Kinetic analysis indicated that the reaction proceeds via a diffusion-controlled mechanism. Chronoamperometric measurements further confirmed the stability of the Au–NiZn/Ti electrocatalyst under operating conditions. Overall, these results demonstrate that the Au–NiZn/Ti electrocatalyst is a highly effective anode material for BOR in fuel cell systems that use sodium borohydride as the energy carrier.