Electrocatalytic activity of the nanostructured Au(Co)/Ti catalysts towards borohydride oxidation

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Direct borohydride fuel cells (DBFCs) are being developed especially for the portable power supply. Since borohydride is used as fuel, the development of electrocatalysts with reasonable costs and a high electroactivity towards its oxidation is of considerable interest to fuel cells.

In this study we have prepared electrodes modified with gold crystallites on the titanium surface, as a substrate, using a simple and low-cost method. For the displacement deposition of Au crystallites on the titanium surface, the Co adlayer was used as a precursor. The Co sublayer was deposited on the titanium surface via electroless deposition [1]. When Co/Ti electrodes were immersed into gold containing solution for various times. Due to spontaneously occurring partial galvanic displacement of electroless Co sublayer with Au, well-adherent gold-coated cobalt (Au-Co) films with nm-scaled particles were formed on the surface of titanium. The surface morphology and composition of the as-prepared catalysts were identified using Field Emission Scanning Eelectron Microscopy and Energy Dispersive X-ray Spectroscopy. The electrochemical behaviour and the catalytic activity of the prepared catalysts towards the oxidation of borohydride were measured by means of cyclic voltammetry, chronopotentiometry and chrono-amperometry. The electrocatalytic efficiency of the catalysts was compared with that of bulk Au and Co/Ti electrodes.

The prepared nano-Au(Co)/Ti catalysts exhibit an enhanced electrochemical activity towards electrochemical oxidation of borohydride as compared to that of bulk Au and Co/Ti electrodes.

The titanium supported the nanostructured Au-Co catalysts seem to be a promising anodic material for direct borohydride fuel cells.

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References

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