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Bimetallic Pd-Pt/graphene aerogel on nickel foam as binder-free anodic electrode for electro-oxidation of ethanol

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Fuel cell is one of the most effective devices for energy conversion with low pollution characteristics that can overcome the pollution problems caused by the consumption of fossil fuels. Direct ethanol fuel cell (DEFC) is one of the most widely investigated fuel cells owing to their high efficiency, low pollutant emission, low operation temperature, ease of handling and transportation, and its non-toxic features. A green and simple method was developed to prepare Pd/Pt alloy NPs (at different ratios based on at percentage) loaded graphene aerogel coated on nickel foam (Pd-Pt/GA/NF) as binder-free anodic electrodes for the electro-oxidation of ethanol. The morphology, chemical composition, and electrochemical performance of the electrodes were analyzed by optical microscopy, scanning electron microscopy/energy dispersive X-ray spectroscopy, X-ray diffraction, X-ray photoelectron spectroscopy and cyclic voltammetry. The results indicated that the Pd/Pt ratio (1:2.9, 1:1.31, 1:1.03), mean particle size, size distribution, and loading of Pd-Pt alloy NPs on GA were dependent on the initial concentration of PtCl₆²⁻ ions in the synthesis. The current density and the poisoning tolerance ability of the electrodes were increased when the Pd/Pt ratio of the electrodes was changed from 1:2.9 to 1:1.03 due to the synergetic effect of the binary Pd-Pt alloy NPs on the electrode and the small particle size of Pd-Pt alloy NPs. The Pd1Pt1.03/GA/NF electrode showed good activity in the electro-oxidation of ethanol with high stability over 1000 cycles.

Biography

K N Hui is an Associate Professor at the Department of Materials Science and Engineering of Pusan National University in South Korea. His current research focuses on synthesis of hierarchical carbon/graphene materials as well as on the development of 3D hierarchical metal oxide materials as advanced electrode materials for energy storage and conversion applications. His research has led to one US patent, 7 Korea patents; four review papers, three book chapters and 86 peer-reviewed SCI journal papers. He has served as guest editor/member of the editorial board of a number of journals.

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