The Nano-structured Ni(II)–chelidamic acid Gold Nanoparticle Self-Assembled Electrode with Catalytic Properties on Methanol Oxidation in Alkaline Medium

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A nano-structured Ni(II)–Chelidamic acid (2,6-dicarboxy-4-hydroxypyridine) film is electrodeposited on a gold nanoparticle-cysteine-gold electrode. The morphology of Poly Ni(II)–Chelidamic acid (Ni-CHE) was investigated by scanning electron microscopy (Fig. 1).

Fig. 1. Typical SEM of, A) Au bare (B), Au-AuNP and (C) Ni(II)/CHE-AuNP-Au electrode.

Electrocatalytic oxidation of methanol on the surface of modified electrode was investigated with cyclic voltammetry and chronocoulometry methods and the results are shown that The nickel chelidamic acid films on gold nanoparticle electrode (Ni/CHE-AuNP-Au) displayed excellent electrochemical catalytic activities towards methanol oxidation The mechanism and kinetics of methanol oxidation have been studied under a wide range of solution conditions and at several electrodes including Pt, Pt oxides [1], Pt-Sn [2], Pt-Ru and nickel [3]. The hydrodynamic amperometry at rotating modified electrode at constant potential versus reference electrode was used for detection of methanol (Fig. 2). Under optimized the detection limit was found to be 50 µM.

Fig. 2. (A) Amperometric response at rotating gold nanoparticle self assembled electrode (curve a), Ni/CHE-Au electrode (curve b), and Ni(II)/CHE-AuNP-Au electrode (curve c) in the presence of different methanol concentration