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S. Premlatha, G.N.K. Ramesh Bapu

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Fabrication of Co-Ni alloy nanostructures on copper foam for highly sensitive amperometric sensing of acetaminophen

S. Premlatha[1]*, G.N.K. Ramesh Bapu

[1]CSIR-Academy of Scientific and Industrial Research,

Electroplating and Metal Finishing Division,

CSIR- Central Electrochemical Research Institute,

Karaikudi-630 003 (Tamilnadu) INDIA.

Abstract

In this work, electrodeposition of Co-Ni alloy nanostructures was performed on copper foam and directly applied as an electrocatalyst for the electrooxidation of acetaminophen (Paracetamol) and its detection. The surface morphology and the elemental composition were investigated using SEM and EDX analyses respectively. The observed morphology was similar to nano cones that are uniformly grown on the electrode surface. EDX analysis also confirmed the presence of both cobalt and nickel in the electrodeposit. The preferred orientation lies in (002) and (110) planes of cobalt and nickel respectively that confirmed the formation of alloy. Electrooxidation of acetaminophen was carried out using cyclic voltammetric method in 0.1 M NaOH solution. On addition of acetaminophen, an apparent anodic oxidation current enhancement was observed with lesser overpotential than cobalt and nickel electrodes which revealed the excellent electrocatalytic activity of the material. Interference studies also revealed the good selectivity for acetaminophen even in the presence of some interfering species. The reproducibility and stability was checked for the proposed Co-Ni alloy modified electrode. The analytical applicability was examined using the commercial paracetamol tablets and the recovery results were also good. The above results revealed that Co-Ni modified electrode on copper foam is a suitable candidate for electrochemical detection of acetaminophen.