

Structural, Electrochemical and Electrocatalysis Studies of a New 2D Metal-Organic Coordination Polymer of Ni (II) Constructed by Naphthalene-1,4-Dicarboxylic Acid; Oxidation and Determination of Fructose

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Abstract : One new 2D metal-organic coordination polymer of Ni(II) namely $[\text{Ni}_2(\text{ndc})_2(\text{DMSO})_4(\text{H}_2\text{O})]_n$, where ndc = naphthalene-1,4-dicarboxylic acid and DMSO= dimethyl sulfoxide has been synthesized and characterized by elemental analysis, spectral (IR, UV-Vis), thermal (TG/DTG) analysis and single crystal X-ray diffraction. Compound 1 possesses a 2D layer structure constructed from dinuclear nickel(II) building blocks in which two crystallographically independent Ni^{2+} ions are bridged by ndc²⁻ ligands and water molecule. The ndc²⁻ ligands adopt μ_3 bridging modes, linking the metal centers into a two-dimensional coordination framework. The two independent NiII cations are surrounded by dimethyl sulfoxide and naphthalene-1,4-dicarboxylate molecules in distorted octahedron geometry. In the crystal structures of 1 there are non-classical hydrogen bonding arrangements and C-H- π stacking interactions. Electrochemical behavior of $[\text{Ni}_2(\text{ndc})_2(\text{DMSO})_4(\text{H}_2\text{O})]_n$ (Ni-NDA) on the surface of carbon nanotube (CNTs) glassy carbon electrode (GCE) was described. The surface structure and composition of the sensor were characterized by scanning electron microscopy (SEM). Oxidation of fructose on the surface of modified electrode was investigated with cyclic voltammetry and electrochemical impedance spectroscopy (EIS) and the results showed that the Ni-NDA/CNTs film displays excellent electrochemical catalytic activities towards fructose oxidation.

Keywords : naphthalene-1,4-dicarboxylic acid, crystal structure, coordination polymer, electrocatalysis, impedance spectroscopy

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