

Electrode Modification through Click Chemistry Using Ni and Co Alkyne Phthalocyanines for Electrocatalytic Detection of Hydrazine

Abstract

This work reports on the development of sensors for the detection of hydrazine using glassy carbon electrodes (GCE) modified with phthalocyanines through click chemistry. Tetrakis(5-hexyn-oxy) cobalt(II) phthalocyanine (complex 2) and tetrakis(5-hexyn-oxy) nickel(II) phthalocyanine (complex 3) were employed as electrode modifiers for hydrazine detection. The GCE was first grafted via the in situ diazotization of a diazonium salt, rendering the GCE surface layered with azide groups. From this point, the 1, 3-dipolar cycloaddition reaction, catalysed by a copper catalyst was utilised to “click” the phthalocyanines to the surface of the grafted GCE. The modified electrodes were characterized by scanning electrochemical microscopy, X-ray photoelectron spectroscopy and cyclic voltammetry. The electrografted CoP2-clicked-GCE and NiP3-clicked-GCE exhibited electrocatalytic activity towards the detection of hydrazine. The limit of detection (LoD) for the CoPc-GCE was 6.09 μM , while the NiPc-GCE had a LoD of 8.69 μM . The sensitivity was 51.32 $\mu\text{A mM}^{-1}$ for the CoPc-GCE and 111.2 $\mu\text{A mM}^{-1}$ for the NiPc-GCE.