

ABSTRACT

Porphyrin nanorods (PNR) were prepared by ionic self-assembly of two oppositely charged porphyrin molecules consisting of free base *meso*-tetraphenylsulfonate porphyrin ($H_4TPPS_4^{2-}$) and *meso*-tetra(*N*-methyl-4-pyridyl) porphyrin (MTMePyP⁴⁺ M=Sn, Mn, In, Co). These consist of $H_4TPPS_4^{2-}$ —SnTMMePyP⁴⁺, $H_4TPPS_4^{2-}$ —CoTMMePyP⁴⁺, $H_4TPPS_4^{2-}$ —InTMMePyP⁴⁺ and $H_4TPPS_4^{2-}$ —MnTMMePyP⁴⁺ porphyrin nanorods. The absorption spectra and transmission electron microscopic (TEM) images of these structures were obtained. These porphyrin nanostructures were used to modify a glassy carbon electrode for the electrocatalytic reduction of oxygen, and the oxidation of hydrazine and methanol at low pH. The cyclic voltammogram of PNR-modified GCE in pH 2 buffer solution has five irreversible processes, two distinct reduction processes and three oxidation processes. The porphyrin nanorods modified GCE produce good responses especially towards oxygen reduction at -0.50 V vs. Ag|AgCl (3 M KCl). The process of electrocatalytic oxidation of methanol using PNR-modified GCE begins at 0.71 V vs. Ag|AgCl (3 M KCl). The electrochemical oxidation of hydrazine began at around 0.36 V on $H_4TPPS_4^{2-}$ —SnTMMePyP⁴⁺ modified GCE. The GCE modified with $H_4TPPS_4^{2-}$ —CoTMMePyP⁴⁺, $H_4TPPS_4^{2-}$ —InTMMePyP⁴⁺ and $H_4TPPS_4^{2-}$ —MnTMMePyP⁴⁺ porphyrin nanorods began oxidizing hydrazine at 0.54 V, 0.59 V and 0.56 V, respectively.