

Optimised Prussian Blue modified electrodes used for the electrochemical oxidation of organic substrates

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Abstract Prussian Blue (PB) modified electrodes were prepared by the deposition of PB from a solution of ferric-ferricyanide onto platinum electrode surfaces using potentiostatic and galvanostatic methods. Preparation and characterisation of the modified electrodes have been carried out in acidic solutions. The amount of PB deposited onto the electrode surface can be controlled by changing the current density, the electrode potential and the time of the electrolysis. The cyclic voltammograms of PB modified electrodes recorded in the transfer solution presents two sets of peaks which correspond to the reduction and oxidation of PB to Prussian White ($E_{1/2} = 0.2$ V vs. SCE) and to Berlin Green ($E_{1/2} = 0.9$ V vs. SCE), respectively. The deposition efficiency and the thickness of the modifier have been determined from chronoamperometric curves and cyclic voltammograms. The electrocatalytic activity of PB was demonstrated in the electrooxidation of ascorbic acid in acidic solution, which is a slow process on bare platinum electrode. A linear response up to 2.5 mM ascorbic acid was obtained. These facts confirm the electrocatalytic activity of PB, as in the cases of oxidation of thiosulphate and the reduction of hydrogen peroxide.

Keywords: Prussian Blue, modified electrodes, cyclic voltammetry, chronoamperometry, ascorbic acid.