

Electrocatalytic determination of dithiocarbamate-based pesticides using electrodes modified with metal phthalocyanines

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Abstract

An electrocatalytic method has been proposed for determining dithiocarbamate-based pesticides (carbathion, nabam, ferbam, thiram, and thiuram) using a carbon-paste electrode modified with iron(II) and cobalt(II) phthalocyanines. The first wave of carbathion oxidation in both aqueous and organic solutions does not change compared to an unmodified carbon-paste electrode; for the second stage of oxidation, a decrease by 100 mV in the overpotential and a significant increase in the current are observed. The electrochemical signal is observed in the range of potentials characteristic for the oxidation of metal phthalocyanines, and the metal phthalocyanine serves as the electron carrier. A similar effect is observed for the electrochemical oxidation of nabam. The catalytic activity of the metal phthalocyanines to ferbam, thiram, and thiuram in acetone has been determined. In the case of the electrochemical oxidation of ziram and zineb, the electrocatalytic effect is not observed. The dependence of the peak current on the pesticide concentration is linear within the range from 1×10^{-3} to 1×10^{-7} M. The adsorption preconcentration of pesticides decreases the limit of detection by an order of magnitude. © 2001 MAIK "Nauka/Interperiodica".
