



A promising Pd/polyaniline/foam nickel composite electrode for effectively electrocatalytic degradation of methyl orange in wastewater

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ABSTRACT

This study was to enhance the electrochemical catalytic performance of the electrode. The foam nickel (Ni) electrode was modified by a two-step electrodeposition method to prepare a palladium/polyaniline/foam Ni electrode. The modified Ni electrode was characterized by scanning electron microscope, scanning cyclic voltammetry, and electrical impedance spectroscopy in comparison with the substrate electrode. The specific surface area and the electrical activity of the modified Ni electrode increased significantly and its charge transfer resistance decreased distinctly. The modified electrode was used for electrocatalytic degradation of methyl orange (MO) and the substrate Ni electrode was as control. The results showed the catalytic degradations of MO both fitted the first-order reaction model well at the voltage of 2 V and the rate constant k_{modified} (0.472 h^{-1}) was larger than $k_{\text{substrate}}$ (0.402 h^{-1}) for the two electrodes. The chemical oxygen demand removal rate (52%) of the modified electrode was higher than that (38%) of the substrate electrode. The ultraviolet-visible spectra showed that the modified electrode was more conducive to the degradation of MO and its intermediates. The degradation rates of azo dye and the decoloration rate decreased a little for five recycles under the voltage of 2 V, indicating that the modified electrode had good stability and could be reused.

Keywords: Modified foam nickel; Electrocatalytic degradation; Azo dye; Methyl orange

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