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A Kinetic Investigation of Electrochemical Degradation of 2-N, N-dimethyl-4-aminophenyl azobenzene carboxylic acid dye at Zr/graphite Modified Electrode in Aqueous Solution

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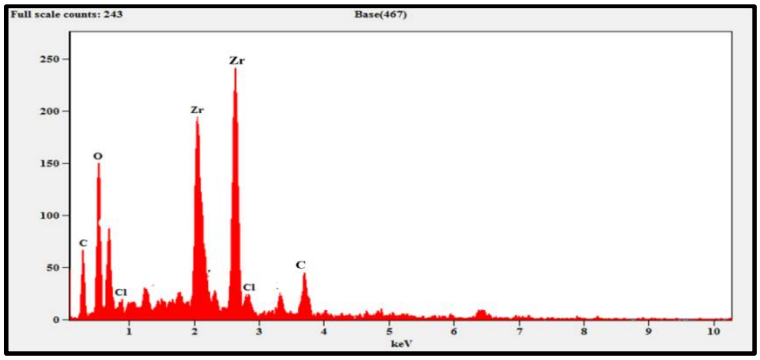
ABSTRACT

The electrochemical degradation of wastewater containing methyl red dye was investigated by synthesized Zr/graphite modified electrode. The kinetics of degradation by graphite and Zr/graphite modified electrode are compared. Methyl red is one of the most important textile dyes. The wastewater of methyl red can be oxidized to anthranilic acid, which is hydrolyzed to N, N–Dimethyl-p phenyldiamine a compound that is toxic to aquatic life. SEM was observed for synthesized Zr/ graphite modified electrode. The thin film formation of Zr or encapsulated in graphite rod is observed from SEM/EDX. The UV-Visible spectra for before and after degradation were studied for methyl red dye. The effect of concentration of the dye and the current on the kinetics of degradation was studied. The ICE values of different experimental conditions are evaluated. The anodic oxidation by Zr/graphite modified electrode showed the complete degradation of water containing methyl red, which is confirmed by UV-Visible and COD measurements. The dye is converted into CO_2, H_2O and simpler inorganic salts. The results observed for reuse of modified electrodes indicates that the Zr/graphite modified electrode would be promising anode for electrochemical degradation of methyl red. This method can be applied for the remediation of waste water containing organics, cost effective and simple.

Graphical Abstract



Energy –dispersive X-ray spectroscopy (EDX) for Zr/graphite modified electrode.

Keywords: Methyl Red, Anodic oxidation, Zr/graphite modified electrode, Mineralization.