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Electrochemical oxidation of phenol in wastewater

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Phenol is a common organic pollutant that contains a hydroxyl group. Many industries such oil refineries, chemical, plastic and dye plants are the main sources of phenolic pollutants. They are more toxic even at low concentrations. According to the Sri Lankan safety regulations, the tolerance limit for phenolic effluents discharged into inland surface waters is 1 mg/L and into marine coastal areas is 5 mg/L. In order to reach these conditions, many treatment techniques have been researched. Among them, electrochemical oxidation has gained more attention due to its advantages over other methods. However, limited studies have been reported in the literature towards the development of anode materials for specific contaminant. Therefore, the aim of this study was to develop an anode material for electrochemical mineralization of phenol as a model compound. In order to accomplish the above objective, the anode was developed with rare metal oxide coatings using the dip coating process. The prepared anode was used in removing phenol from synthetic wastewater samples. Samples were oxidized in an electrochemical cell with the prepared anode and each sample was tested for the phenol concentrations. The phenol oxidation was carried out at a constant current density of 20 mA/cm^2 in Na_2SO_4 medium (pH 11.00) at room temperature for 6 hrs. The phenol removal efficiency under the above conditions was 49.8%. The intermediate formation was predicted by pH variation of the system. Generation of the hydroxyl radical in the system during electrolysis was investigated and confirmed using 4-nitroso-N,N-dimethylaniline (RNO).The experimental findings reveal that electrochemical oxidation can be used for treating phenol in wastewater.

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