



Effect of operational parameters on the removal of phenol from aqueous solutions by electrocoagulation using Fe and Al electrodes

Mehmet Kobya^{a,*}, Erhan Demirbas^b, Oguz Sahin^a

^aDepartment of Environmental Engineering, Gebze Institute of Technology, 41400 Gebze, Turkey
Tel. +90 (262) 6053214; Fax: +90 (262) 6538490; email: kobya@gyte.edu.tr

^bDepartment of Chemistry, Gebze Institute of Technology, 41400 Gebze, Turkey

Received 31 December 2011; Accepted 12 February 2012

ABSTRACT

The removal of phenol from aqueous solutions in a batch electrocoagulation (EC) process using Fe and Al electrodes was investigated. Experiments were carried out to remove phenol by the EC covering a wide range of operating conditions such as initial pH (4–9), current density (20–80 A/m²), initial phenol concentration (20–80 mg/L), conductivity (500–1,500 µS/cm), and operating time (0–100 min). The optimum operating conditions were determined as initial pH 7.0, initial concentration of 50 mg/L, current density of 40 A/m², operating time of 100 min, and conductivity of 1,200 µS/cm for both electrodes, respectively. The removal efficiencies of phenol at the optimum operating conditions were 98.6% for Fe electrode and 99.2% for Al electrode. The operating cost and consumptions of electrode and energy in the EC process were calculated as 7.4 €/m³, 3.85 kg/m³, and 43.27 kWh/m³ for Fe electrode and 6.1 €/m³, 1.28 kg/m³, and 42.18 kWh/m³ for Al electrode, respectively. The EC process with Al electrode was found to be more efficient than the EC process with Fe electrode in terms of the removal efficiency and operating cost.

Keywords: Electrocoagulation; Phenol removal; Operating cost; Iron electrode; Aluminum electrode

*Corresponding author.