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COLOR REMOVAL FROM PULP MILL EFFLUENT USING COAL ASH PRODUCED FROM GEORGIA COAL COMBUSTION PLANTS

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Abstract

In this study, Coal Fly Ash (CFA), a byproduct of coal combustion power plants, was used as an adsorbent to remove color from locally-obtained pulp mill effluent (PME). Batch adsorption studies were conducted to determine the adsorption parameters that would result in the maximum color removal from PME at the lowest CFA dosage and process cost. The effects of operating variables on color removal were studied by varying: 1) CFA dosage, 2) initial PME pH, and 3) contact time. The findings indicate that the optimum CFA dosage for cost-effective color removal was 100.0 g/L (80.5% removal) given an initial effluent color concentration below 900 mg/L Pt-Co color units. For effluent samples with a color concentration over 900 mg/L Pt-Co color units, the optimum CFA dosage was 250.0 g/L (80.4% removal). In addition, no pH adjustment of the PME was required for maximum color removal. A kinetic study showed that color removal by CFA occurred rapidly in the first hour, and adsorption equilibrium was achieved at 24 hours. Additionally, the kinetic and isotherm adsorption data was best described by the Ho et al. kinetic model and the Langmuir and Freundlich isotherm models, respectively. Overall, this research found CFA to be a promising low-cost adsorbent for the removal of color from PME.

Key words: adsorption, Coal Fly Ash (CFA), color removal, Pulp Mill Effluent (PME)

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