Treatment of simulated petrochemical wastewater by means of continuous electrocoagulation-ultrafiltration process

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December 2006

Abstract

A combined Electrochemical-Ultrafiltration process was investigated for the treatment of simulated petrochemical refinery wastewater. Phenol, crude oil and kaolin were added in concentrations typical to a refinery wastewater to simulate the soluble, immiscible and colloidal phases, respectively. Stainless steel electrodes were used in the electrochemical cell, while a submersible membrane module was utilized for ultrafiltration. The results showed that high amount of Total Dissolved Solids (TDS) in the raw water had a significant interference in the degradation of phenol. Conversely, UV-Spectrophotometer, GC and GC-MS analysis revealed a complete conversion of phenol into chlorophenols in the deionized water as base solvent, and sodium chloride as electrolyte. It is proposed that the high pH due to electrolysis of brine and the presence of chloride and ferric ions may have caused electrophilic substitution of phenoxy ion. The further degradation of cholorophenols remained a subject of further research. The COD analysis also suggested removal of organic compounds; however, the reliability of results was affected by major interference due to chlorides. A removal efficiency of 99 percent was achieved for turbidity, where as oil was removed completely.