A Study of Basic and Reactive Dyes Removal from Synthetic and Industrial Wastewater by Electrocoagulation Process

Authors : Almaz Negash, Dessie Tibebe, Marye Mulugeta, Yezbie Kassa

Abstract : Large-scale textile industries use large amounts of toxic chemicals, which are very hazardous to human health and environmental sustainability. In this study, the removal of various dyes from effluents of textile industries using the electrocoagulation process was investigated. The studied dyes were Reactive Red 120 (RR-120), Basic Blue 3 (BB-3), and Basic Red 46 (BR-46), which were found in samples collected from effluents of three major textile factories in the Amhara region, Ethiopia. For maximum removal, the dye BB-3 required an acidic pH 3, RR120 basic pH 11, while BR-46 neutral pH 7 conditions. BB-3 required a longer treatment time of 80 min than BR46 and RR-120, which required 30 and 40 min, respectively. The best removal efficiency of 99.5%, 93.5%, and 96.3% was achieved for BR-46, BB-3, and RR-120, respectively, from synthetic wastewater containing 10 mg L1of each dye at an applied potential of 10 V. The method was applied to real textile wastewaters and 73.0 to 99.5% removal of the dyes was achieved, Indicating Electrocoagulation can be used as a simple, and reliable method for the treatment of real wastewater from textile industries. It is used as a potentially viable and inexpensive tool for the treatment of textile dyes. Analysis of the electrochemically generated sludge by X-ray Diffraction, Scanning Electron Microscope, and Fourier Transform Infrared Spectroscopy revealed the expected crystalline aluminum oxides (bayerite (Al(OH)3 diaspore (AlO(OH)) found in the sludge. The amorphous phase was also found in the floc. Textile industry owners should be aware of the impact of the discharge of effluents on the Ecosystem and should use the investigated electrocoagulation method for effluent treatment before discharging into the environment.

Keywords : electrocoagulation, aluminum electrodes, Basic Blue 3, Basic Red 46, Reactive Red 120, textile industry, wastewater
Conference Title : ICMEER 2024 : International Conference on Materials Electrochemistry and Electrochemical Reaction
Conference Location : Toronto, Canada
Conference Dates : June 13-14, 2024

Open Science Index, Chemical and Materials Engineering Vol:18, No:06, 2024 publications.waset.org/abstracts/174229.pdf