

Evaluation of Performance of Adsorption and Coagulation Processes for the Maximum Removal of Reactive Dyes

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Physicochemical processes of adsorption and coagulation were systematically evaluated for the removal of reactive dyes (Orange 16 and Black 5) in a laboratory scale experimental setup. The effectiveness of combined processes of adsorption and coagulation for complete removal of dyes was also investigated. The right sequence of operation was identified for the combined treatment system. A coconut-based powdered activated carbon (PAC) was used as an adsorbent and alum chloride was chosen as a coagulant. The results indicated that adsorption capacity of Orange 16 was much higher than that of Black 5. Also, adsorption capacity on PAC was highly dependent on the pH of solution. The dye removal efficiencies for 100 mg l⁻¹ of Black 5 and Orange 16 by coagulation were almost 99% and 80% under the determined optimal conditions for Black 5 (250 mg l⁻¹ coagulant dose and pH 6) and for Orange 16 (350 mg l⁻¹ coagulant dose and pH 6). Coagulation followed by adsorption was found to be more efficient than having adsorption prior to coagulation. There was a significant increase in adsorption capacity of PAC for the combined process.