

Activated Carbon as a Remedial Agent for Dyed Textile Effluents

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Abstract

The textile industry is one of the major contributors to industrial wastewater pollution due to the extensive use of synthetic dyes, chemicals, salts, and other processing agents. Dyed textile effluents are often characterized by intense coloration, high chemical oxygen demand (COD), organic pollutants, and potentially toxic compounds that can adversely affect aquatic ecosystems and human health. Conventional treatment methods may be expensive or generate secondary pollutants, creating a need for efficient, economical, and environmentally sustainable remediation technologies. Activated carbon has emerged as an effective adsorbent for the removal of dyes and other organic contaminants from textile wastewater because of its high surface area, porous structure, and strong adsorption capacity. This study explores the potential application of activated carbon for treating dyed textile effluents, with particular emphasis on the removal of color and organic pollutants. The adsorption process can be influenced by several parameters, including adsorbent dosage, contact time, initial dye concentration, pH, temperature, and particle size. The study also considers the potential use of activated carbon produced from agricultural and other low-cost biomass residues, which may provide an environmentally sustainable alternative to commercially produced activated carbon. Effective adsorption can significantly reduce the visible color and pollutant load of textile wastewater and improve the quality of treated effluent before discharge or reuse. The application of activated carbon therefore represents a promising approach for sustainable textile wastewater management and pollution control.

Keywords: Activated Carbon, Textile Effluent, Dye Removal, Adsorption, Wastewater Treatment, Decolorization, Organic Pollutants, Sustainable Remediation, Industrial Wastewater, Environmental Pollution.