Adsorption of İndigo Carmine From Aqueous Solutions Onto Beech (*Fagus Orientalis* L.) Sawdust as a Low Cost Adsorbent

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Abstract

Most of the industries including textiles, pulp mills, leathers, plastics, cosmetics, foods and pharmaceuticals require the use of various raw materials and chemicals so the resulting wastewaters contain many harmful elements and compounds such as organic materials and heavy metals. Among the different organic compounds released along with industrial effluents, dyes and pigments are one of the most dangerous and considerable water pollutants since some dyes cause toxic or mutagenic, teratogenic and carcinogenic effects on aquatic life and also on humans when present in waters even at low concentrations. Because of the common utilization of indigo carmine in industrial applications, the removal of it from industrial wastewaters is important in terms of protection of public health, environment and aquatic life. The abundantly available beech sawdust is one of the cost-effective adsorbent for removal of dyes from aqueous solutions. Hence, in the present study, we aimed to test the ability of natural and H_2SO_4 modified beech (*Fagus orientalis* L.) sawdust to remove indigo carmine through batch adsorption process. Firstly, adsorbents were characterized using several techniques including Boehm titration, moisture content, pH_{pzc} and FTIR techniques and then the influence of various experimental parameters such as initial pH of the aqueous solution, initial dye concentration, contact time, and adsorbent concentration were evaluated upon the adsorption process in the ranges of 1.0-8.0, 50-1000 mg L^{-1}, 0-360 min and 0.01-0.2 g, respectively. It was found that the maximum uptake of dye occurred at initial pH 2.0 and optimum contact time was observed as 120 min for both adsorbents. The interferences of foreign ions were also evaluated. Indigo carmine adsorption on adsorbents analysed by the Langmuir, Freundlich, Temkin and Dubinin Radushkevich (D-R) isotherm models. The pseudo-first order, pseudo-second order, and intraparticle diffusion models were employed to describe the adsorption kinetics. The results indicate that the natural and H_2SO_4 modified beech sawdust can be used as an effective and no-cost adsorbent for the treatment of industrial wastewaters contaminated with dyes.

Keywords: Adsorption, Removal, Dye, Indigo carmine, Fagus orientalis L.