Utilization of pumpkin (*Cucurbita pepo*) seed husks as a low-cost sorbent for removing anionic and cationic dyes from aqueous solutions

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**Abstract**

The aim of this study was to examine the possibility of using pumpkin (*Cucurbita pepo*) seed husks as a low-cost sorbent to remove dyes popular in the textile industry, that is, anionic dyes: Reactive Black 5 (RB5) and Reactive Yellow 84 (RY84), and cationic dyes: Basic Violet 10 (BV10) and Basic Red 46 (BR46). The sorbent was subjected to the Fourier-transform infrared spectroscopy (FTIR) analysis. The scope of the research included also the determination of pH (pH 2–11) influence on the efficiency of dye sorption, sorption kinetics (equilibrium time, pseudo-first-order model, pseudo-second-order model, intramolecular diffusion model), and sorption capacity (Langmuir 1 and 2 models, Freundlich model). The optimum pH range for RB5 and RY84 sorption on the tested sorbent was pH 2–3. In the case of BV10, sorption was most effective at pH 3 and in the case of BR46 at pH 6. In each case, the best fit to the experimental data was shown for the pseudo-second order model. The intramolecular diffusion model showed the sorption of each dye to proceed in the three main stages, varying in intensity and duration. Pumpkin seed husk sorption capacity of the anionic dyes was 0.96 mg g⁻¹ for RB5 and 1.08 mg g⁻¹ for RY84. In the case of cationic dyes, the sorption capacities of the tested sorbent were many time higher and reached 96.01 mg g⁻¹ for BV10 and 163.39 mg g⁻¹ for BR46.

**Keywords:** Sorption; Unconventional sorbents; Pumpkin seed husk; Dyes

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