



Effect of cetyltrimethylammonium bromide on the biosorption of Acid Blue 25 onto Bengal gram fruit shell

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ABSTRACT

This study explores an intensive investigation of the effect of cationic surfactant, cetyltrimethylammonium bromide (CTAB) on biosorption of Acid Blue 25 (AB25), an anionic dye, onto Bengal gram fruit shell (BGFS) from aqueous solution. The BGFS was characterized using Fourier transform infrared spectroscopy and scanning electron microscopy. Effect of AB25 and CTAB concentrations, time and temperature, were explored. The dye uptake by the BGFS was increased with increasing initial dye concentration up to 100 mg L⁻¹. The inclusion of 0.9 mmol L⁻¹ of CTAB in the biosorption medium was greatly improved for the removal of AB25. The AB25 uptake was better described by the Langmuir adsorption model than the Freundlich model. This study shows that the maximum uptake of AB25 dye by BGFS in the absence of surfactant was evaluated and found 29.4 mg g⁻¹. Also, the results of this investigation revealed that the presence of 0.9 mmol L⁻¹ CTAB in the biosorption medium increased the maximum uptake of AB25 to 166.6 mg g⁻¹, which is 5.7 times higher than the uptake capacity in the absence of CTAB. The biosorption kinetics was correctly described by the pseudo-second-order kinetic model for all cases studied a confirmation that a chemisorption process controlled the biosorption rate. Thermodynamic parameters (ΔH° , ΔS° , and ΔG°) were determined for the biosorption of AB25 onto BGFS-CTAB. The biosorption process describes that the reaction was exothermic and spontaneous processes.

Keywords: Biosorption; Bengal gram fruit shell; Acid Blue 25; Cetyltrimethylammonium bromide

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