



## Simultaneous adsorption of methylparaben and propylparaben dyes from aqueous solution using synthesized *Albizia lebbbeck* leaves-capped silver nanoparticles

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### ABSTRACT

The *Albizia lebbbeck* leaves-capped silver nanoparticles (ALLC AgNPs) were synthesized, and their applicability for dyes eliminating from aqueous media have been investigated. Identical techniques, including scanning electron microscopy, Fourier transform infrared spectroscopy, and X-ray diffraction analysis, utilized to characterize these novel materials. The ALLC AgNPs were found available, suitable, and bargain-counter adsorbents for the proper removal of methylparaben (MP) and propylparaben (PP) dyes from aqueous media. By examining the effect of different parameters, it was found that the percentage of adsorption and the initial concentrations of MP and PP dyes were inversely related, while the percentage of adsorption and adsorbent dose were directly related. It was shown that the maximum adsorption of MP and PP dyes and their removal by adsorbent was at pH 7.0. The adsorbent dosage of 50 mg in pH 7 has been considered the optimum values for adsorption of MP and PP dyes with a concentration of 10 mg/L onto ALLC AgNPs. The Langmuir model was better at describing equilibrium data than other models. Enthalpy ( $\Delta H^\circ$ ), entropy ( $\Delta S^\circ$ ), and free energy ( $\Delta G^\circ$ ) as thermodynamic parameters of adsorption were determined using isotherms. The fact that the adsorption process was endothermic was well reflected by negative values ( $\Delta G^\circ$ ,  $\Delta H^\circ$ , and  $\Delta S^\circ$ ), which alone indicated the tendency to synthesize ALLC AgNPs to remove MP and PP dyes. The maximum monolayer coverage capacity ( $q_{\max}$ ) was 6.7 mg/g for MP and 8.5 mg/g for PP at desired conditions.

*Keywords:* Adsorption; Paraben dyes, Isotherms, *Albizia lebbbeck* leaves-capped silver nanoparticles, Thermodynamic

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