Synthesis of silver nanoparticles and its spectroscopic studies as a colorimetric sensor

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Abstract In the first part of the present study, silver nanoparticles (Ag NPs) were synthesized through reduction of silver nitrate by sodium borhydride in presence of sodium dodecyl sulfate as stabilizing agent. The nanoparticles were utilized as a surface plasmon resonance (SPR)-based sensor for detection of persulfate ion. Based on the obtained results, absorbance strength of the localized SPR band of Ag NPs was considerably dependent on the persulfate concentration Moreover, changes in the absorbance as a function of pH were examined and maximum absorbance was observed in pH=9. Achieving good sensitivity and linear response over the concentration range of 10-5–10-2 mol L-1 showed that the nanosensor can be potentially applied in fast and accurate determination of persulfate ion in aqueous samples. In the second part of the study, response surface method was employed to optimize Direct Green 26 (DG 26) removal aqueous solutions using magnetic multi-walled carbon nanotube nanocomposite (M-MWCNT) as adsorbent. The experiments were carried out based on a Box-behnken design with three input variables including adsorbent dosage (0.05-0.15 g/L), contact time (25-45 min), pH (2.5-8.5). Dye concentration of 100 mg/L was taken as fixed input parameter. Optimum values of the variables for maximum adsorptive removal of DG 26 were predicted by the model (w=0.15 g/L; pH=8.41; t=44.9 min). Experimental checking resulted in the removal efficiency of 99.62%. Good agreement between the predicted and the experimental values of dye removal percentage confirmed high efficiency of the response surface method in optimization DG 26 removal using M-MWCNT Keywords: Silver nanoparticles; Persulfate ion; Optical nanosensor; Localized surface plasmon resonance; Response surface modeling; Magnetic nanocomposite; Dey removal.

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