

عنوان مقاله:

Fe₃O₄/AC nanocomposite as a novel nano adsorbent for effective removal of cationic dye: Process optimization based on Taguchi design method, kinetics, equilibrium and thermodynamics

محل انتشار:

مجله بین المللی فناوری نانو در آب و محیط زیست، دوره 3، شماره 4 (سال: 1397)

تعداد صفحات اصل مقاله: 16

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خلاصه مقاله:

In this study, we have synthesized a new Fe₃O₄/AC nanocomposite using low-cost adsorbent by microwaveassisted in situ co-precipitation technique that was used as an effective adsorbent for the removal of methylene blue (MB) using the Taguchi design method as an optimization strategy. The optimum parameters are pH 7, Fe₃O₄/AC nanocomposite dose 0.03 g, contact time 30 min, initial concentration of MB 25 mg/L and temperature 298 K. The obtained results of ANOVA show that their percent contribution in descending order is pH (66.81%) > adsorbent dose (25.54%) > temperature (4.83%) > initial MB concentration (1.23%) > contact time (0.32%). The kinetic data were fitted to the pseudo-first-order, pseudo-second-order and intra-particle diffusion models and adsorption of MB dye followed pseudo-second-order kinetics. The obtained values of regression coefficient for Langmuir (0.98), Freundlich (0.93) and Dubinin–Radushkevich (0.94) showed that adsorption process fits to the Langmuir isotherm and the maximum adsorption capacity is 384.6 mg/g. Moreover, the thermodynamics studies suggested the spontaneous nature of the adsorption process.

کلمات کلیدی:

Magnetite Nanoparticles, Methylene Blue, Microwave-Induced, Nanocomposite, Taguchi Method

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