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Solid phase extraction and spectrophotometric determination of Congo red in environmental samples using bentonite and surfactant-modified bentonite

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In the present work, bentonite (Bn) clay, from Egypt, has been modified using CTAB to produce the CTAB-modified bentonite (CTAB-MBn). The prepared adsorbents have been used for removal of Congo Red (CR) dye from environmental samples via batch test. The experimental data were analyzed using first order kinetics, pseudo-second order kinetics and intra-particle diffusion models. It is found that kinetics followed the pseudo-second order equation. The equilibrium isotherm data are analyzed according to Langmuir and Freundlich equations. The thermodynamic parameters including ΔG°, ΔH° and ΔS° for the adsorption processes of CR on Bn and CTAB-MBn were also calculated; and the negative values of ΔG° indicated the spontaneous nature of adsorption. The proposed adsorbents were successfully applied to the removal of CR from different water samples with a recovery % >93% and a relative standard deviation, RSD, <3%.The dye uptake onto Bn, A-AKn, A-ABn and CTAB-MBn as a function of initial CR concentration. It is revealed that, by increasing the initial dye concentration in test solution the amount of CR adsorbed per unit mass of adsorbent increase. When the initial concentration of CR increases from 30 to 1000 mg/l at 25°C, the amount of CR adsorbed at equilibrium (qe) increased from 9.145 to 37.046 mg/g, from 14.347 to 74.352 mg/g, from 14.907 to 108.161 mg/g, and from 49.998 to 210.103 mg/g for Bn, A-AKn, A-ABn and CTAB-MBn adsorbents, respectively. It appears that an increase in adsorbate concentration results in an increase in the driving force, which leads to an increase in the CR diffusion rate. Fig. 4.1.30.b shows the adsorption process of CR by CTAB-MBn.

Biography

Al-Awadhi is an Assistant Professor, 2015 PhD Analytical Chemistry, Faculty of Science, and Mansoura University, Egypt. He did his MSc Organic Chemistry, Faculty of Science from Assuit University, Egypt, 2009 BSc (Chemistry), Faculty of Science, Sana`a University, Yemen. His research interest lies in: Activated carbon, clay, nanostructured materials, fabrication, control of shape and size, modification, characterization and application. Synthesis of some heterocyclic compounds derived from furan of biological importance. Using of different chemical techniques as FTIR, UV-VIS, CHN, TGA, DTA, mass, NMR, AAS, conductance and magnetic properties measurements to determine the structure of the organic and inorganic compounds separation of undesired materials present in drinking water using modification of some adsorbents (activated carbon, bentonite, kaolinite, nanocomposite membranes, nano-tubes, nanoscopic particles).

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