Preparation and Characterization of Fish Scale /Silica (FSS) Nanocomposites as Adsorbents of textile Dyes.

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Abstract

The best conditions of adsorption were 35^{0}C, 10min and weight of nanocomposite/amount of dye rate 0.5:0.318.

Introdução

Several technologies are being investigated aiming at the removal of dyes from the textile industry, among them those involving adsorption, low cost and easy operation[1]. In this context, the use of fish scale as dye adsorbents emerged as a viable alternative, given its abundance in nature. In this sense, this research prepared FSS nanocomposites mixing fish scale fibers of the species *Salminus Franciscanus* and silica nanoparticles by remove indigo carmine dye from aquatic systems. For this, experimental design 2^3 was been used for determinate the best condtions of adsorption[2].

Resultados e Discussão

For this purpose, fish scales were trated, crushed and sieved (48 mesh). Different amounts of the fish scale fibers were dispersed in the ethanol-water-NH_4OH-TEOS reagent system. The reaction mixtures were stirred for 24h at room temperature[3]. Morphology analysis of the FSS nanocomposites samples by TEM confirmed the formation of spherical nanoparticles of silica on the surface of fish scale fibers. The IR spectra of FSSi nanocomposites samples revealed that the characteristic vibration bands correspond to Si-O-Si and Si-OH groups, confirmed the presence of silica nanoparticles on the fish scale fibers (Fig.1).

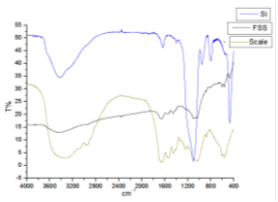

Fig. 1. FTIR: a) Silica b) FSS c) Fish Scale.

The results of TG showed that silica nanoparticles improved the thermal stability of fish scale fibers, confirming the formation of FSS nanocomposites. The results obtained by BET analysis showed an increase in the surface area for the FSS nanocomposites samples, compared to the fish scale fibers.

Tab. 1. Surface area for the FSS nanocomposites samples by BET.

Sample	Surface area
Fish Scale	35,4179 m²/g
FSS 1	71,5765 m²/g
FSS 2	63,8421 m²/g
FSS 3	69,3696 m²/g
FSS 4	66,6736 m²/g
FSS 5	41,4826 m²/g

We used the factors: (1) temperature (-)35^{0}C and (+)45^{0}C, (2) time of adsorption (-)10min and (+)30min and (3) weight of scale/amount of dye rate (-)0.5:0.318 and (+)1.0:0.318. Experimental design was analyzed by the Statistica 9.0. (Fig.2).

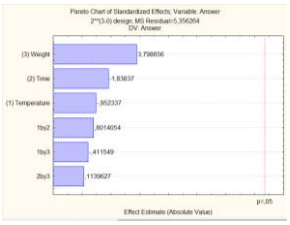

Fig. 2. Pareto's Graphs.

The Pareto's graphs showed that the change of factors (1) and (2) decreased the adsorption dye-scales, but the adsorption increases when we modified from (-) for (+) by factor (3). However, no factores are significantly (p=0,05).

Conclusões

We believe that the FSS nanocomposites prepared might be promising adsorbents of textile dyes. The best conditions of adsorption were 35^{0}C, 10min and weight of nanocomposite/amount of dye rate 0.5:0.318.

Agradecimentos

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