ADSORPTION OF ANIONIC DYES FROM AQUEOUS SOLUTIONS ONTO «POLYANILINE – PLANT WASTES» COMPOSITES

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Huge amount of anionic dyes in contaminated water are generated as the result of substantially usage of dyes in various processes of such industries as dyestuff, textile, paper, printing, cosmetic, etc. The presence of toxic anionic dyes in wastewater is one of a major environmental concern nowadays. These dyes are carcinogens and toxic products and they may degrade to produce toxic compounds. Adsorption method employing activated carbon was reported to be the most widely used for anionic dyes removal in wastewater. But, activated carbon was found to be uneconomical due to its cost and regeneration difficulties. To minimize processing costs, several recent investigations have focused on the use of low-cost composites based on plant wastes, especially on agricultural plant wastes, which are not always used efficiently and often incinerated or taken on the landfilled. For high adsorption capacity these plant wastes are treated by different modifiers. Particular attention is given to modifying by polyaniline (PAN). Analysis of published articles showed a little works directed to producing composites based on agricultural plant wastes coated by polyaniline for removing anionic dyes from wastewater [1-3].

The aim of this study was to coat corn stalks (CS) and barley straw (BS) by (PAN) in the various acidic medium (HCl-(1), H_2SO_4-(2), H_3PO_4-(3)) and to research their properties for removing anionic dyes (Acid Red (AR) and Acid Orang (AR)).

Agricultural plant wastes which were selected in this study are natural organic polymers and have in their structure the functional groups (-OH, -COOH, >C=O) which can be modified. At the same time they are cheap, renewable and affordable raw materials.

The activation of agricultural plant wastes was performed like this way: to distilled water (module 1:20) was added pulverized CS and BS incubated for 24 hours at 20 ° C, then washed with distilled water and dried at 50 ° C to constant weight. Prepared samples of CS and BS used for synthesis of composites according to [4].

The FT-IR spectra of composites based on CS and BS were obtained and analyzed in this study. The presence of bands characterized the benzoid and quinoid groups in the FT-IR spectra of composites based on CS and BS is confirming the modification of agricultural plant wastes by PAN. At the same time, minor changes in the observed FT-IR spectra, indicating the process of "soft" modification.

Physico-chemical properties of studied composites are shown in Table were: S – specific surface area; pH_{pzc} – pH in point of zero charge; Δ - bulk density; V_Σ – summary pore volume on benzene.

Table

Physico-chemical properties of composites

Composite	S, $м^2/g$	pH_{pzc}	Δ, g/cm^3	V_Σ, cm^3/g
CS	20,4	6,3	0,14	0,113
CS -PAN-1	38,6	3,0	0,16	0,155
CS - PAN -2	39,1	3,0	0,17	0,152
CS - PAN -3	46,9	3,0	0,17	0,154
BS	22,8	6,3	0,15	0,136
BS - PAN -1	29,6	3,0	0,16	0,145
BS - PAN -2	31,1	3,0	0,17	0,144
BS - PAN -3	31,5	3,0	0,17	0,143

Dye adsorption was investigated in static conditions according to [5]. Adsorption studies showed that the adsorption capacity of composites modified by PAN increases the degree of adsorption removal of anionic significantly in 2-3,5 times as compare with unmodified agricultural plant wastes. Then the optimal conditions of adsorption were determined in this study.

The effect of pH on the adsorption of anionic dyes showed on Fig. It was determined that the high degree of anionic dyes on all composites was observed in a pH range from 2 to 4. The degree of adsorption of anionic dyes decreased in pH range from 6 to 10. The high degree of adsorption of anionic dyes on unmodified agricultural plant wastes installed only at pH = 2.

The effectiveness of adsorption treatment depends essentially from the dosage of the composite. It was found that the optimal dosage of composites is the 6 g/L.

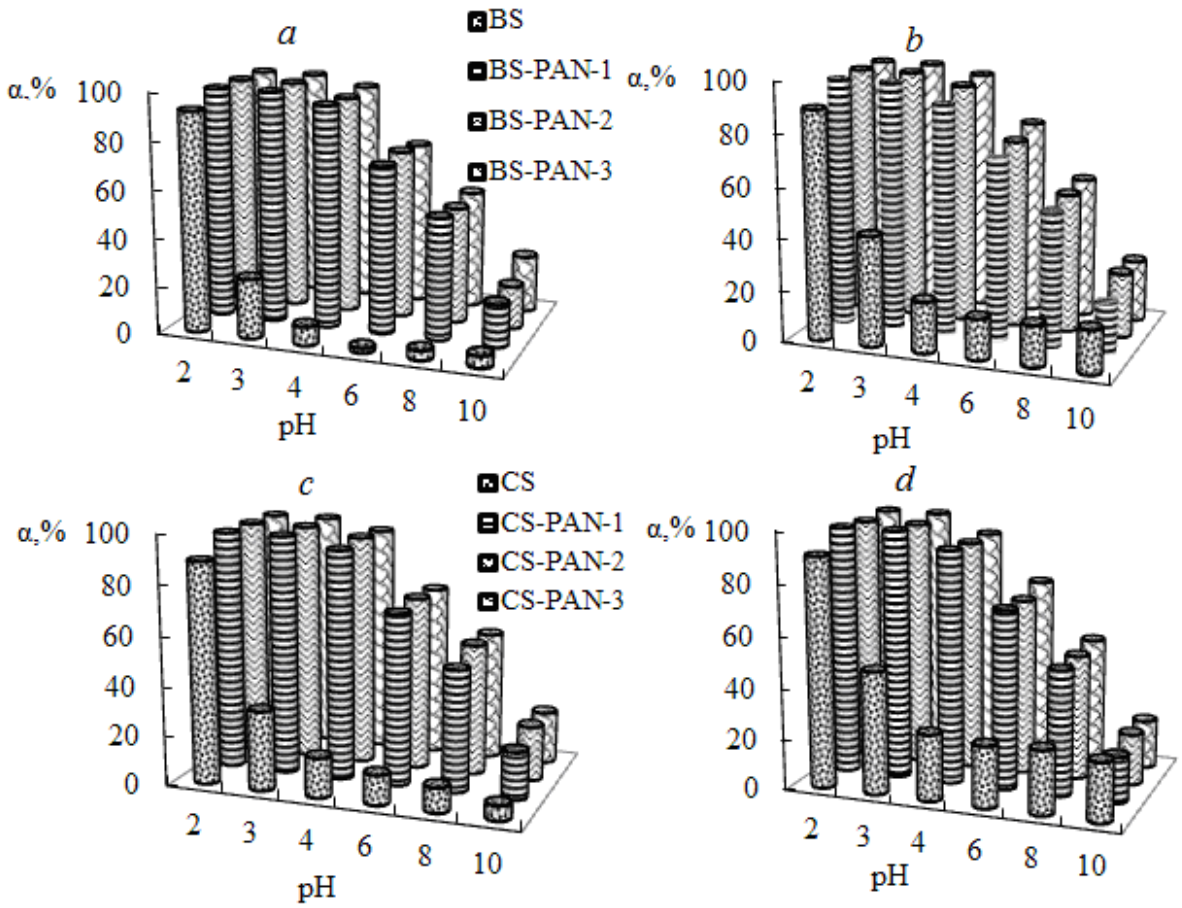

Fig. Effect of pH on the adsorption removal of Acid Red (*a*, *c*) and Acid Orange (*b*, *d*).

Thus, composites based on CS and BS, coated by PAN in the various acidic medium are effective for removing wastewater from anionic dyes. It was found that the nature of acidic medium for modification of composites does not effect on their adsorption properties.

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