

SYNTHESIS OF "CORN STALKS-POLYANILINE" COMPOSITE FOR ADSORPTION REMOVAL OF AN ANIONIC DYE

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In the last decades, there has been considerable interest in the synthesis of polyaniline (PAN) and its composites, which contain imine and amine groups. Thus, they could adsorb anions of dyes via electrostatic interactions or hydrogen bonding. Nowadays, there are only a few studies about the obtaining modified plant wastes (rice husk and sawdust) using PAN for removing of anionic dyes from wastewater. To our knowledge corn stalks covered by polyaniline (CS-PAN) has never been used as an adsorbent for the removal of anionic dyes.

It is known that the synthesis of PAN depends on the temperature and concentrations of polyaniline, dopant, and oxidant. Unfortunately, the information about synthesis of composites from plant wastes with PAN is extremely small and contradictory. A full factorial experimental design helps to study the influence of the important factors of the synthesis on adsorption properties of composites with PAN.

The main purpose of present research is to synthesize CS-PAN composite for the adsorption removal of anionic dyes from aqueous solution and to evaluate the influence of synthesis temperature (T), concentrations of aniline (C_1), H_3PO_4 as a dopant (C_2), and $(NH_4)_2S_2O_8$ as an oxidant (C_3) on its adsorption properties using a full factorial experimental design analysis 2⁴.

We carried out the factorial design at two levels ($T=278$ and 298 K, $C_1=C_3=0.1$ and 0.3 M, $C_2=0.05$ and 0.25 M), which included 16 experiments and each experiment was repeated twice. The adsorption removal efficacy of Acid Red as an anionic dye was dependent response variable.

The obtained results showed that the influence of control factors increases in order: $T < C_1 < C_2 < C_3$. The concentrations of aniline, dopant, and oxidant have positive effect, while the synthesis temperature has a very small negative effect. By means of an experimental design analysis 2⁴ we found that the highest adsorption properties of CS-PAN (removal efficacy Acid Red 98 %) were obtained when the concentrations of aniline, oxidant, and dopant are at their high level: 0.3, 0.25, and 0.3 M, respectively. These values correspond to molar ratios of aniline/dopant=1.2 and aniline/oxidant=1. It was found that the synthesis temperature doesn't influence on adsorption properties of the composite under these conditions.