Ultrasound-assisted adsorption of Auramine-O dye on to the copper-doped zinc sulfide nanoparticles loaded on activated carbon: Optimization by artificial neural network and genetic algorithm

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Abstract

In this paper, artificial neural network (ANN) and genetic algorithm (GA) were applied to observe the optimal practical conditions, i.e., adsorbent dosage, sonication time, MB concentration, Auramine-O (AO) concentrations, Er concentration as input parameters and % removal AO as output parameters. To enhance the adsorption of AO dye from ternary aqueous solutions containing AO, Erythrosine (Er) and Methylene Blue (MB) were rapidly performed onto the copper-doped zinc sulfide nanoparticles loaded on activated carbon (ZnS:Cu-NP-AC). After examination the different ANN architectures an optimal structure of the model, i.e. 5-12-1 is obtained with the mean absolute error 1.5% and R2 = 0.9994. The suggested structure was used as fitting function for genetic algorithm. Comparison of the predicted values with the experimental data showed that the GA–ANN model is a powerful method to find the optimal conditions for preparing of copper-doped zinc sulfide nanoparticles loaded on activated carbon with the highest adsorption of AO dye. Moreover, sensitivity analysis revealed that AO concentration and Er concentration and MB concentration have the higher and lower effect on % removal AO, respectively.

Keywords*:* Auramine-O dye, copper-doped zinc sulfide nanoparticle, activated carbon, Genetic Algorithm, Artificial Neural Network, sensitivity analysis

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