

## عنوان مقاله:

Response surface methodology and adaptive neuro-fuzzy inference system for adsorption of reactive orange ۱۶ by hydrochar

## محل انتشار:

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## خلاصه مقاله:

**BACKGROUND AND OBJECTIVES:** The prediction models, response surface methodology and adaptive neuro-fuzzy inference system are utilized in this study. This study delves into the removal efficiency of reactive orange ۱۶ using hydrochar derived from the *Prosopis juliflora* roots. Hydrochar dose, pH, temperature, and initial reactive orange ۱۶ concentration were studied in batch processes. The correlation coefficients for the batch processes were found to be ۰.۹۷۸ and ۰.۹۹۹۹. The results denote that the adaptive neuro-fuzzy inference system predicted the reactive orange ۱۶ removal efficiency more accurately than the response surface methodology model. **METHODS:** *Prosopis juliflora* roots are converted into hydrochar to remove azo dye from textile waste water. *Prosopis juliflora* roots were collected from Ramanad District, Southern Tamil Nadu, India. The moisture content was lowered by drying for ۲۴ hours at ۱۰۳ degree celcius in an oven with hot air. This biomass was thermally destroyed at ۳۰۰ degree celcius for ۱۵ minutes without oxygen in an autoclave in a muffle furnace (heating rate: ۵ degree celcius per minute). As soon as it reaches room temperature, the hydrochar residue of this biomass was used for adsorption investigations. The batch adsorption process was conducted for ۶ hours in a ۲۵۰ milliliter Erlenmeyer conical flask with a ۱۰۰ milliliter working volume using an orbital shaker. The pH, dosage, concentration, and temperature are the four parameters chosen for this study to find the maximum removal efficiency of the dye from aqueous solutions. This study validated adaptive neuro-fuzzy inference system, an artificial neural network with a fuzzy inference system, using response surface methodology projected experimental run with Box–Behnken method. **FINDINGS:** The adaptive neuro-fuzzy inference system model is created alongside the response surface methodology model to compare experimental outcomes. Experimental data was evaluated using a hybrid least square and gradient technique. Statistical and residual errors assessed experimental and mathematical model correctness. Experimental data matched the adaptive neuro-fuzzy inference system results. Statistical error analysis verified the model's accuracy and precision against experimental data. **CONCLUSION:** Response surface methodology and adaptive neuro-fuzzy inference system optimized process conditions. At pH ۲, ۲ gram per litre hydrochar dosage, ۳۵ degree celcius, and a reactive orange ۱۶ starting ... concentration of ۲۵۰ milligram per liter, removal effectiveness reached ۸۶.۱ percent. Adaptive neur

## کلمات کلیدی:

Adaptive neuro-fuzzy inference system, Hydrochar, Reactive orange-۱۶ (RO ۱۶), Response surface methodology, Statistical error analysis

