

Application of genetic algorithm and artificial neural networks in bioremediation process

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Development of an automated effluent treatment plant is very difficult as the parameters of an industrial effluent change continuously. Hence, a computer-simulated model is required for predicting the relationship between input and output parameters. Experiments were conducted to study the efficiency of adsorbent prepared from Acacia Arabica fruits for removal of Methylene Blue (MB) dye. The adsorbed dye on green carbon was characterized by Fourier transform-infrared spectroscopy (FTIR) and Scanning electron microscopy (SEM). RSM was used to design the experimental runs. An artificial neural network model was developed and optimized for the prediction of percentage removal of dye from the effluent. The network was trained using the experimental data obtained at different process parameters such as temperature, initial pH, contact time, adsorbent dosage and initial dye concentration of the solution. Different algorithms and transfer functions for hidden layer have been tested to find the most suitable and reliable network. The prediction efficiency of this ANN model was tested and it was found that prediction was good.

The ANN model developed was optimized using genetic algorithm (GA). This experiment revealed that the adsorbent exhibited high adsorption capacities. The kinetic data obtained was analyzed using pseudo-first order, pseudo-second order and intra particle diffusion models. Thermodynamic studies were also carried out. The adsorption was efficient and both Langmuir and Freundlich isotherm models showed good fit into the experimental data. From these studies, it may be concluded that green carbon adsorbent prepared is efficient and economical for Methylene blue removal from aqueous solutions.

Keywords: Acacia Arabica, ANN, GA, RSM, Biosorption

Biography

Narayana Saibaba K.V has completed his B.Tech in Chemical Engineering with Biotechnology as specialization from Andhra University and Masters in Chemical Engineering with Petroleum Refining Engineering as elective from Andhra University. He also completed MBA with dual specialization in HRM and Finance. He is currently pursuing his Ph.D under the guidance of Prof. P. King. He has published more than 15 papers in international journals of repute. His papers also published in the CHEMCON (top workshop for chemical engineers). Prof. P. King published more than 100 papers in reputed journals and serving as editorial board member of repute journals.

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