MODELLING FOR ZINC (II) ADSORPTION USING GREEN AND RECYCLABLE ADSORBENT: ANN and ANFIS.

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ABSTRACT

The current study aims to determine how well an adsorption approach in a laboratory-scale reactor removes zinc (II) from an aqueous solution. In this work, ANFIS and the ANN was use to predict the green adsorbents' adsorption capacity in removing zinc (II). Four operational variables were studied: The contact time in minutes, the dosage of the green adsorbent in mg/100 mL, the intial concentration of the Zinc (II) solution in mg/L, and pH. The output was the removal percentage (%) and adsorption capacity (mg/g). ANN and ANFIS approach were built using 60% of the data for training, with the remaining 40% for validation and testing. According to the findings, the the adaptive neuro fuzzy interference system models are a potential method for making predictions about the adsorption of Zinc (II). Based on this result, the training dataset's (RMSE) Root mean square error, (AARE) Average Absolute Relative Error, (ARE) Absolute Relative Error, (MSE) Mean Squared Error and R^2 for ANFIS model was found to be 0.021, 0.048, 0.012, 0.015, and 0.988. For ANN model, the AARE, RMSE, ARE, MSE, and R^2 were found to be 0.013, 0.020, 0.021, 0.032, and 0.997. The Langmuir model best fitted the adsorption whereas the pseudo-second order model, which governs the adsorption mechanism. The green adsorbent was studied for morphology, functional groups, thermal properties, and crystallinity. Although the functional groups of the adsorbent were similar to the CNCs, the TGA analysis showed that the adsorbent exhibited more excellent heat stability. The nanocomposites' needle-like shape, tiny particle size, and porous structure were all visible in the SEM.

Keywords: ANFIS, ANN, Green adsorbent, Adsorption, Levenberg-Marquardt, Zinc (II).