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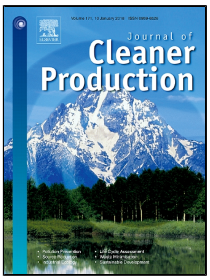

ANN-Derived Equation and ITS Application in the Prediction of Dielectric Properties of Pure and Impure CO_2

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ANN-DERIVED EQUATION AND ITS APPLICATION IN THE PREDICTION OF DIELECTRIC PROPERTIES OF PURE AND IMPURE CO_2

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Abstract

High-performing equation has been step-wisely extracted from artificial neural network (ANN) simulation and subsequently applied for the prediction of the dielectric properties of pure and impure CO_2. Data of relative permittivity (ε_r) for pure and impure CO_2 were used in the ANN to train different ANN structures so that the network can recognise and predict CO_2 property under different conditions. Analyses of the results from the training showed that single-layer ANN model [3-6-1] outperformed others. From this best-performing ANN structure, a single mathematical equation was extracted that can be employed in predicting ε_r for pure CO_2 and CO_2-ethanol mixture, even without access to ANN software. Using this ANN-based mathematical model, predictions of the relative permittivity (ε_r) for pure CO_2 and CO_2-ethanol mixture were performed, under different temperatures and pressures and at different ethanol concentrations. Under similar conditions, the output of the model provides good match with the original experimental ε_r. With increment in ethanol concentration, the model correctly predicted the rise in ε_r for the mixture. Also, it was shown that the ε_r rises with an increase in pressure but decreases with a rise in temperature. The work showed the