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An expert model for the prediction of water gases thermodynamic properties

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ABSTRACT

Knowledge of the thermodynamic properties of water is necessary for the interpretation of physical and chemical processes. In the current research a new method based on artificial neural network (ANN) was applied for the prediction of water gases thermodynamic properties. The required data were collected and after pre-treating was used for training of ANN. Also the accuracy and trend stability of the trained networks were tested by it generalization ability in predicting of unseen data. The back-propagation learning algorithm, with different training methods such as scaled conjugate gradient (SCG), Levenberg–Marquardt (LM), gradient descent with momentum (GDM), variable learning rate back propagation (GDA) and resilient back propagation (RP) were used for the purpose. The SCG with seven neurons in the hidden layer showed the best performance with minimum mean square error of 0.0001517. Finally, ANN model performance was compared with classical thermodynamical models for the specific volume prediction of superheated water. Some equations of state such as Lee Kesler, NRTL, Soave–Redlich–Kwong and Peng–Robinson were used for the purpose. The comparisons showed the ANN capability for prediction of the thermodynamic properties of water gases.

Keywords: Thermodynamic properties, Water gases; Prediction; Artificial neural network; Equation of state

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