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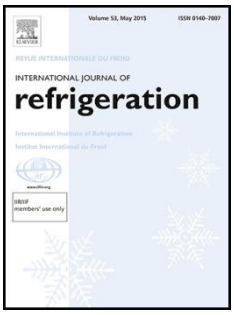

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Thermodynamic properties of lubricant/Refrigerant mixtures using statistical mechanics and artificial intelligence

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Highlights

- Prediction of densities of refrigerant+lubricant mixtures using artificial neural network.
- Prediction of densities of refrigerant+lubricant mixtures using modified TM EOS.
- Prediction of excess molar volume of refrigerant+lubricant mixtures using ANN.

Abstract

In this research, the volumetric properties of sixteen lubricant/ refrigerant mixtures are predicted using the developed statistical mechanical equation of state at a broad range of temperatures, pressures and mole fractions. The equation of state have been examined using corresponding states correlation based on just one input parameter (density at room temperature) as scaling constants. Besides, the artificial neural network (ANN) based on back propagation training with 19 neurons in hidden layer was tested to predict the behavior of binary mixtures of lubricant/ refrigerant. The AADs% of a collection of 3961data points for all binary mixtures using the EOS and the ANN at various temperatures and mole fractions are 0.92% and 0.34%, respectively. Furthermore, the excess molar volume of all binary mixtures calculated from obtained densities of ANN, and the results shown these properties have good harmony with literature.

Keywords: Refrigerant, Lubricant, Excess molar volume, Statistical mechanics, Artificial neural network.

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