Thermophysical Properties of R410A Correlated by the Patel-Teja Equation of State

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This study presents a new equation of state (EOS) developed for R410A, and confirms its validity by comparing it with calculation results of the published EOS and/or experimental measurements.

The proposed EOS is based on the Patel-Teja EOS. A cubic EOS, such as the Patel-Teja EOS, coupled with an appropriate mixing rule is probably the most extensively used approach in modeling the vapor-liquid equilibrium of mixtures. Especially, it is known that the Patel-Teja EOS can predict both the vapor-liquid equilibrium and saturated liquid density of mixtures successfully, even if a mixture is high nonideal.

The results calculated by using the proposed EOS for bubble point pressure and dew point pressure up to 340 K corresponded to those computed by the published EOS within 0.5% accuracy. Saturated liquid density, saturated vapor density and latent heat calculated using the proposed EOS had an accuracy of 1%. Comparison with the measurements of bubble point pressure, dew point pressure and saturated liquid density showed good agreement. The accuracy was within 1%. Because of the simple mathematical form of the proposed EOS, it can be concluded that it would be more useful and suitable to build onto plant simulation software than more complex EOSs such as the multi-term Helmholtz function EOS.