Peng-Robinson Plus Association Equation of State for Hydrofluorocarbon Systems

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The objective of this work is to present an association equation of state for hydrofluorocarbon systems in which a Peng-Robinson-type cubic term plus the SAFT association term constitute the residual Helmholtz energy of the equation of state. Expressing the equation in the formalism of the residual Helmholtz energy facilitates the calculation of caloric and saturation properties. In total, the equation involves three adjustable coefficients in the cubic term and four in the association term. The equation was applied to HFC-32, HFC-125, HFC-134a, HFC-143a, and HFC-152a, and to the systems (HFC-32 + HFC-125), (HFC-32 + HFC-134a), (HFC-125 + HFC-134a), (HFC-125 + HFC-143a), (HFC-134a + HFC-143a), and (HFC-134a + HFC-152a), (HFC-32 + HFC-125 + HFC-134a) and (HFC-125 + HFC-134a + HFC-143a). For pure compounds, the percentage overall average absolute deviations were 2.1 in *prT*, 5.3 in vapour pressures, 2.3 in saturated-liquid densities, 3.5 in isochoric heat capacities, 3.6 in isobaric heat capacities, and 4.6 in speeds of sound. For mixtures, the percentage overall average absolute deviations were 1.4 in *prT*; 0.18 in speeds of sound, and 1.3 in bubble-point vapour pressures. All of these results are better than are those obtained with the conventional Peng-Robinson equation.