Study on the Interaction Coefficients in PR Equation with VdW Mixing Rules for HFCs and HCs Binary Mixtures

J.X. Chen, P. Hu[C, S] and Z.S. Chen
Department of Thermal Science and Energy Engineering, University of Science and Technology of China, Hefei, Anhui, China
hupeng@ustc.edu.cn

PR equation of state with the van der Waals mixing rules were used to correlate the Vapor-Liquid Equilibria (VLE) data for the HFC/HC, HFC/HFC and HC/HC binary mixtures. The interaction parameters k_{ij} were obtained for every binary mixtures. We assume that k_{ij} is contributed by the two components, and every refrigerant has its own constant contribution k_i for mixtures. The values of k_{ij} indicate the difference between the components. Therefore, the interaction parameters k_{ij} is proposed as: $k_{ij}=k_i-k_j$. The values of k_i for HFCs and HCs, including Propane, Isobutane, n-butane, HFC32, HFC125, HFC134a, HFC143a, HFC152a and HFC227ea, were obtained by the least-squares fitting. Twenty-four refrigerant binary mixtures were calculated on the basis of this method and compared with the experimental data, namely HFC32/Propane, HFC125/Propane, HFC134a/Propane, HFC143a/Propane, HFC227ea/Propane, HFC32/Isobutane, HFC134a/Isobutane, HFC152a/Isobutane, HFC32/n-Butane, HFC125/n-Butane, HFC134a/n-Butane, HFC32/HFC125, HFC32/HFC134a, HFC32/HFC134a, HFC32/HFC143a, HFC32/HFC152a, HFC32/HFC227ea, HFC32/HFC227ea, HFC125/HFC134a, HFC125-HFC143a, HFC125/HFC152a, HFC134a/HFC143a, HFC134a/HFC152a, HFC134a/HFC227ea, HFC143a/HFC152a and HFC152a/HFC227ea. The results show that the VLE properties calculated by the derivated interaction parameters have good agreement with the experimental data. The overall average absolute deviation of pressures and vapor mole fractions are 1.3% and 0.0089, respectively.