Development of an Accurate, Generalized Equation of State for Refrigerants

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Since the Montreal Protocol mandated a phase out of chlorofluorocarbon refrigerants, there has been a major, world-wide research effort to find viable, environmentally acceptable replacements. In conjunction with this effort a substantial amount of new thermophysical property data has been collected and used to develop specialized, high accuracy equations of state for the replacement fluids.

In this study we have developed an accurate generalized equation of state for refrigerants with the emphasis being placed on chlorofluoroethanes. The equation has been developed by combining data for various fluids via a corresponding states principle and then using a stepwise regression selection algorithm to find the optimal form of the equation of state. The primary fluids which have been used to develop the equation of state include R123, R125, R134a, R143a and R152a as well as R32.

In this presentation, we will describe our development of the generalized equation of state and present the results of comparisons of the equation with the base data and other pure-fluid refrigerant data. The extension of the equation to mixtures will be briefly discussed, and preliminary mixture phase equilibrium and single-phase property predictions will be compared to experimental data.