

## Phase Equilibria Prediction of Selected Hydrocarbon/Hydrofluorocarbon Mixtures

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Organic Rankine cycle (ORC) receives much attention for recycling low grade thermal energy, such as biomass, geothermal energy, and waste heat. Recent research shows that ORC systems using mixture as working fluid has better performance than that using pure working fluid, because of better temperature match between heat source and working fluid and less irreversible loss. Similar with ORC using pure working fluid, selection of working fluid also has great influence on cycle performance of ORC system using mixture as working fluid. And thermodynamic properties of mixture are fundamental and crucial for fluid selection and cycle design. Besides, the properties in the critical region are very important since research has shown that cycle efficiency increases as the evaporation pressure approaches critical pressure. Therefore, the main objective of this paper is to provide a good method to describe the vapor-liquid equilibrium (VLE) and single phase properties of mixture for hydrocarbon/hydrofluorocarbon, including mixture of R600, R600a, R601, R601a, and R236ea, R245fa. The main reason for choosing these mixtures is that they can compensate the disadvantages of each other and the mixture is more environmental friendly than the pure fluid. In this paper, crossover volume translation SRK(VTSRK) equation of state(EoS) we developed before was extended to hydrocarbon/ hydrofluorocarbon mixtures (R600/R236ea, R600/R245fa, R600a/R236ea, R600a/R245fa, R601/R236ea, R601/R245fa, R601a/R236ea, R601a/R245fa) combined with Vander Waals(VDW) mixing rule. The results predicted by crossover VTSRK EoS were compared with the experimental data for mixtures in the one and two-phase regions. Comparison results show that the crossover VTSRK EoS improved the description of thermodynamic properties, especially in the critical region. This lays a foundation for working fluid selection and cycle design of ORC.