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Simulation of multi-component transcritical flow using in situ adaptive tabulation of vapor-liquid equilibrium solutions[1] HONGYUAN ZHANG, SUO YANG, University of Minnesota — The studies of trans- and supercritical injection have attracted much interest in the past 30 years. However, most of them were mainly concentrated on the single-component system, whose critical point is a constant value. To capture the thermophysical properties of multi-component, a phase equilibrium solver is needed, which is also called a vapor-liquid equilibrium (VLE) solver. But VLE solver increases the computation cost significantly. Tabulation methods can be used to store the solution to avoids a mass of redundant computation. However, the size of a table increases exponentially with respect to the number of species. When the number of species is greater than 3, the size of a table far exceeds the limit of RAM in today's computers. In this research, an online tabulation method based on In Situ Adaptive Tabulation (ISAT) is developed to accelerate the computation of multi-component fluid. Accuracy and efficiency are analyzed and discussed. The CFD solver used in this research is based on a four-equation two-phase flow model. Peng-Robinson equation of state is used in phase equilibrium.

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