Joule-Thomson Coefficient Prediction by using a Cubic Plus Association (CPA) Equation of State

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The Joule Thomson effect happens when a fluid passes through any kind of restriction such as a nozzle or an expansion valve in an isenthalpic expansion process. When it occurs, the fluid temperature will decrease or increase with the pressure drop. The relation between the pressure drop and the temperature change is given by the coefficient of Joule-Thomson. This coefficient depends on physical factors as initial temperature, initial pressure, and fluid phase and also depends on chemical factors for example the composition of the fluid. Due its dependence on many factors, prediction of the coefficient of Joule-Thomson represents a challenge from the point of view of thermodynamics, but because of the wide application of this effect in the chemical and petrochemical industries, several methodologies have been developed in order to predict this coefficient. This work aims to evaluate the use of a Cubic Plus Association (CPA) equation of state (EoS) in a procedure to calculate the Joule-Thomson coefficient for simple substances (propane, methane, water etc.), and also mixtures of two or three components (propane and water; methane and water; propane and methane; methane and propane and water). The coefficient is also calculated for two-phase conditions, evaluating the influence of the multi-phases in the effect. The results acquired were compared with both experimental and correlated data. It was found the CPA is able to deliver satisfactory results for practical applications in the industry.