Experimental Determination of (*p, ρ, T*) Data for Binary Mixtures of Methane and Helium

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Experimental characterization of the thermodynamic behavior of gas binary mixtures containing components of fuel gases is of great importance due to the proved lack of reliable data of thermodynamic properties of mixtures. These data are essential not only for the improvement and test of the current reference equation of state for natural gases and related mixtures, GERG-2008, but also for the indirect determination of other properties. GERG-2008 equation of state is based on formulations developed for 21 pure components and for the binary mixtures of these components. Due to the lack of experimental data for binary mixtures, and to the complexity of the process, most of the binary systems were taken into account by using adjusted reducing functions for density and temperature. Only for those binary mixtures for which sufficient accurate experimental data were available, binary specific departure functions or a generalized departure function were developed. For the binary mixture methane-helium no departure function was developed. In this work density measurements for three binary mixtures of methane with helium are presented. Therefore, accurate density measurements for binary mixtures of methane with helium (x_{He} = 0.05, 0.10, 0.50) are performed at temperatures between 250 K and 400 K, and pressures up to 20 MPa, using a single sinker densimeter with magnetic suspension coupling, which is one of the state of the art methods for density determination over wide ranges of temperature and pressure.