

## **PVT Measurements of Binary Mixtures of Methane and Carbon Dioxide, Butane or Heptane with a Magnetic Suspension Densimeter and an Isochoric Apparatus**

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Accurate measurements of the density of gas mixtures are essential to improving the equations of state used for natural gas processing. They are also required either to correlate transport properties or as essential information to determine, for example, the viscosity values obtained from a vibrating wire viscometer. Single-phase densities of mixtures of methane + carbon dioxide, methane + butane and methane + heptane at pressures either to 30 MPa or below the lower dew point were measured using a commercial dual sinker magnetic suspension densimeter at temperatures between (293 and 373 )K with a relative uncertainty of 0.3 %. To determine densities at pressures above the upper dew point (or bubble point) a custom isochoric apparatus, capable of operating at pressures of up to 140 MPa, was constructed. Densities and bubble points were measured with this apparatus at temperatures between (200 and 320) K and pressures to 35 MPa. The uncertainty in density measured with this apparatus was better than 0.2 %. The measured densities from both apparatus and the bubble points from the isochoric apparatus will be compared with those calculated using the GERG 2008 equation of state and literature data.