

High Accuracy Density Measurements for Pure Nitrogen, Carbon Dioxide, Methane and Ethane in the Range of 265 K to 450 K Up to 200 MPa with Single Sinker Magnetic Suspension Densimeter

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We report density data for pure nitrogen, carbon dioxide, methane and ethane obtained using a high-pressure single sinker Magnetic Suspension Densimeter (MSD) over a temperature range of 265 K to 450 K at pressures up to 200 MPa. Temperature stability of the MSD is ± 5 mK and pressure measurements have an uncertainty of $\pm 0.002\%$ of the full scale. We have used both titanium and copper sinkers for these measurements and compared the results to the NIST-12 database and GERG-2004 predictions. Using the titanium sinker, we find deviations within 0.05% at 2σ with respect to NIST-12 and 0.15% at 2σ for GERG-2004 predictions. The copper sinker deviations are almost double across the full range of pressure.