

Force Transmission Analysis for a High Pressure Magnetic Suspension Densimeter

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A magnetic suspension densimeter (MSD) is a sophisticated state-of-the-art device which yields the most accurate results in density measurements. The MSD uses a magnetic coupling technique. Due to the magnetic coupling working principle of the apparatus, magnetic properties of the high-pressure cell and the external magnetic fields, measurements are slightly affected. We present a Force Transmission Error (FTE) analysis for a high-pressure single-sinker Magnetic Suspension Densimeter (MSD). For the analysis, we used three different sinkers: a titanium sinker and a copper sinker with same weight and a third one made out of copper with the same volume as the titanium sinker. Density for pure methane, ethane, carbon dioxide and nitrogen is measured between the temperature range of 265 K and 450 K (± 5 mK stability) up to 200 MP (uncertainty of $\pm 0.002\%$). A comprehensive analysis of the FTE and the systematic error in the low pressure range has led to a uniform deviation for density values, around 0.05% at 2σ , across the full range of pressure.