

## **The Four-Sinker Densimeter – A New Gravimetric Apparatus for Accurate Measurements of Dew-Point Densities of Fluid Mixtures**

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The provision of accurate experimental dew-point densities is a further step in advancing the description of vapor-liquid equilibria of fluid mixtures by thermodynamic property models. Here, our previous studies revealed the need of developing a more accurate measurement technique that accounts for the distorting influence of sorption phenomena on precision density measurements. Even the sophisticated two-sinker density measurement principle does not compensate for changes in mixture composition due to sorption phenomena, both in the homogeneous gas phase and in the vicinity of the dew point. Moreover, density measurements of pure fluids are also affected by a high rate of adsorption in the region close to the dew line. Therefore, a special four-sinker densimeter has been designed, fabricated and set up. This densimeter combines the application of classical two-sinker densimetry as a differential method with the additional weighing of two sorption sinkers; this additionally enables a quantitative determination of the sample mass adsorbed onto the sinker's surface. Hence, accurate dew-point densities can be determined based on the simultaneous measurement and correction of sorption phenomena. The new instrument covers the temperature range from (190 to 470) K at pressures up to 20 MPa. We will present the background of the development of the four-sinker densimeter and the design that allows to overcome the limitations of existing gravimetric densimetry. Furthermore, we will show and discuss the steps and difficulties of the apparatus' commissioning.