

Uncertainty Estimates for Density Measurements in Magnetic Suspension Densimeters

Diego Ortiz, Ivan Mantilla, Hugo Acosta, Martin Gomez-Osorio and James Holste
Texas A&M University, Chemical Engineering, College Station, TX, U.S.A.

Kenneth Hall^{C, S}
Texas A&M University at Qatar, Administration/Chemical Engineering, Doha, Qatar
krhall@tamu.edu

Gustavo Iglesias-Silva
Instituto Tecnológico de Celaya, Chemical Engineering, Celaya, Guanajuato, México

A complete description of the combined uncertainty for density measurement using a magnetic suspension densimeter contains the effects from multiple sources: the apparatus (force transmission error, material properties) and measurement uncertainties associated with pressure, temperature, gas constant, balance masses and molecular masses. This paper presents a thorough analysis of the combined uncertainty for density accounting for all these effects. Applying the analysis to some arbitrary mixtures reveals that the largest source of error is the apparatus effect followed by the pressure effect. All the others are minor by comparison in quality laboratories, but they are easy to include. It is also possible to determine how the accuracy of the balance used in a gravimetric preparation of the mixture affects the density employing this technique.