

Development of the State of the Art Magnetic Levitation Densimeter for PVT Property Measurements of Fluids

Yohei Kayukawa^{C,S}, Kennichi Fujii and Yuya Kano

*National Metrology Institute of Japan, National Institute of Advanced Industrial Science and Technology,
Tsukuba, Japan*

Haruki Sato

Department of System Design Engineering, Keio University, Yokohama, Japan

A Magnetic Levitation Densimeter (MLD) used for precise density measurement of fluids even under non ambient temperature and pressure condition was developed at NMIJ. As for the conventional MLD, fluid density was measured by weighing a sinker via magnetic coupling. Because of an imperfectness of the magnetic coupling, there exist slight force transmission errors resulting in a density measurement error on the order of 10^{-4} . The authors have proposed a new type of MLD in which the magnetic levitation is repeated at the constant vertical position. In addition to this levitation technique, we have employed a dual-sinker system so as to compensate the small linear effect between the force transmission error and the sinker density. Since the force transmission error is no longer an uncertainty source, the new densimeter can achieve very high accuracy in density measurement, being about 0.001 kg m^{-3} . The soundness of the measurement was confirmed with n-tridecane calibrated against the solid density standard made of 1 kg silicon sphere. Some preliminary experimental results for hydrocarbons and carbon dioxide are presented.