

Random and Systematic Errors Propagation in PVT(x) Properties Measurements with Burnett-Isochoric Method

XiaoJuan Feng^S and YuanYuan Duan^C

Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Tsinghua University, Beijing, China

Hong Lin

Heat Division, National Institute of Metrology (NIM), Beijing, China

Burnett-Isochoric experiments are considered to be one of the most accurate and important methods to obtain PVT(x) (pressure, specific volume, temperature, mole fraction of mixtures) properties of fluids. Virial coefficients can also be deduced from the Burnett-Isochoric results. The literature experimental data showed that quite a number of the second virial coefficients obtained from Burnett-Isochoric method were more negative than those from sound speed results. As the times of Burnett expansion increase, small random and/or systematic errors in the measurement system become important and have a significant effect on the experimental results. The random and systematic errors of the temperature measurement system, the pressure measurement system, the mole fraction variation of mixtures, as well as the adsorption effect of the gases on the surface of the Burnett cells were considered and simulated. The simulation results were also compared with the experimental results to clarify the reason for the differences of the second virial coefficients. Feasible suggestions were given on the experimental procedure performance and data deduction process of Burnett-Isochoric method to obtain more precise experimental results.