Mutual Diffusion Coefficient of 2-Isopropoxypropane (DIPE), 2-Methoxy-2-Methylpropane(MTBE) in Isooctane by Digital Holographic Interferometry from 293.15 to 343.15K

Shi Zhang [S], Maogang He [C] and Ying Zhang

MOE Key Laboratory of Thermal Fluid science and Engineering, Xi'an Jiaotong University, Xi'an, China

mghe@mail.xjtu.edu.cn

Fuel additives are used to accelerate combustion process, to improve combustion efficiency, and to reduce off gas pollution. DIPE and MTBE have been considered as two important additives in petrol. However, there is little experimental data concerning their thermophysical properties. The mutual diffusion coefficient is one of these properties and is related closely to the atomization and combustion process within combustion engines and is required for numerical simulation of the combustion process. But the data of mutual diffusion coefficients related to DIPE or MTBE is rare. So the prediction and measurement of mutual diffusion coefficient is of increasing interest. The digital holographic interferometry was employing. This method is one of the most widely used techniques with good accuracy for diffusivity studies of transparent liquid. A new method to determine the zero time of starting to diffuse was proposed in this work. Therefore, the problem presented by Szydlowska et al. (1982) that diffusion coefficient measured in one experiment became larger with time increasing was avoided obviously. The standard uncertainty in temperature is 0.016 K and the relative expanded uncertainty in mutual diffusion coefficient was estimated to be less than 1.5% over the whole investigated thermodynamic range. The accuracy of our apparatus is certified by measuring the mutual diffusion coefficient of KCl in water with the concentration of 0.33mol/L at 298.15 K. The absolute average deviation of experimental results with literature data is about 1.3%.2,2,4-trimethylpentane(isooctane) was selected as the standard substances substituted for petrol because petrol is very complex mixture and isooctane has the similar combustion characteristic and carbon numbers with petrol. So the mutual diffusion coefficients of DIPE and MTBE in isooctane were measured at temperature ranging from 293.15 to 343.15K, respectively. Then the experiment data were correlated as the functions of temperature and concentration of DIPE and MTBE, respectively.