Mass Diffusion Coefficients of Dimethyl Carbonate and Diethyl Carbonate in n-Heptane and in Air

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With the rapid depletion of petroleum-based fuels and the ever-increasing serious automobile-related air pollution, more works are encouraged worldwide to research on clean alternatives. Oxygenated fuels have been proven to be the most promising substitutes for the fossil fuels to significantly reduce diesel engine exhaust emissions. Ester substances as one kind of oxygenated fuels, due to its features such as highly oxygen content, lower boiling point and prominent combustion and emission characteristics, becomes one of the more effective additives for diesel engines. For further research, the thermophysical properties of these oxygenated fuels are needed. There is already some research on the thermophysical properties of these oxygenated fuels, such as viscosity (Comunas, 2001 and Amalendu, 2000), surface tension (Kumar, 2003), thermo conductivity (Jin XG, 2004), critical parameters, saturated densities , vapor pressure, virial coefficient (Yaws, 1999), etc. But, there is little experimental data on the mass diffusion coefficient, although it is one of the most important thermophysical properties, which has a close relationship with research on spray, atomization and combustion process of combustion engine, and is also a key parameter on numerical simulation of combustion processes. For these reasons, an experimental apparatus for measurement of the mass diffusion coefficient was constructed using the digital image holographic interferometry technique, and the absolute average of relative deviations of the mass diffusion coefficient measurement is within 1.20 % as reported previously (ECTP, 2008). With this system, the mass diffusion coefficients of dimethyl carbonate and diethyl carbonate in n-heptane and in air are measured at 21 different temperatures in this paper, and the uncertainties of mass diffusion coefficient at each temperature point is analyzed.