Surface Tension and Viscosity Measurement of Some Fuels Using the (Surface Laser-Light Scattering) SLLS Method

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In recent years, with the background of energy shortages and environmental problems, searching for and developing clean environmentally friendly and acceptable alternative fuels has become an urgent task. It has been found that alcohols, ethers and esters are potentially clean alternative fuels because of the oxygenated fuel's low emission and because they are easily obtained. Surface tension and viscosity are important thermophysical properties of fluids, but it are acutely absent for the alternative fuels and their mixtures, such as dimethoxy ethane, diethyl carbonate, 1-propanol, 2-propanol and n-butanol. In this work an experimental system was established to investigate surface tension and viscosity simultaneously. It is based on the capillary wave theory induced by thermal fluctuations in the internal liquid. Surface tension and viscosity of liquids can be obtained by investigating the ripples using the surface laser-light scattering method (SLLS). The surface tension of methanol and ethanol were measured using this system, and the deviations were less than ±2%. The surface tensions and viscosity of five pure fluids, dimethoxy ethane, diethyl carbonate, 1-propanol, 2-propanol, n-butanol, and two mixtures, methanol + n-heptane, and methyl alcohol + iso-octane were measured with SLLS, and 80 surface tension and viscosity data points were obtained. The excess surface tensions were calculated and the surface tension data were correlated as a function of compositions, and the standard deviations were less than $0.01 mN \cdot m^{-1}$.