

Measurement of the Thermal Conductivity of Dimethoxymethane and Diesel Oil Mixtures by Transient Hot Wire Method

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As petroleum resources become depleted and environmental pollution becomes more serious, especially in developing countries, finding and developing new alternative clean fuels has become an urgent problem. In recent research, it was found that dimethoxymethane ($\text{CH}_3\text{-O-CH}_2\text{-O-CH}_3$) as a fuel additive can greatly improve diesel oil and petrol combustion properties. Furthermore, it has a large oxygen content (42 % by mass) and is miscible with diesel fuel, and is therefore regarded as a good fuel additive and a potential alternative fuel. For these applications, the thermophysical property data of dimethoxymethane and its mixtures are important, but there is little data in the literature. In our previous work, the liquid thermal conductivity and saturated vapor pressure of pure dimethoxymethane were measured.

In this work, the thermal conductivities of dimethoxymethane and diesel oil mixtures were measured by the transient hot wire method. The temperature range was from 240 to 375 K and the pressure range was from 1.0 to 30.0 MPa. The uncertainty in the temperature and pressure are within ± 10 mK and ± 0.1 % ($k = 2$), respectively. The expanded uncertainty of the results is estimated to be within ± 2.0 %, and the reproducibility of the data is better than ± 0.5 %. The measured thermal conductivity data are correlated as a function of temperature and pressure for engineering applications.