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# Measurements of diffusion coefficient for triolein in various pressurized fluids with different viscosities

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Abstract (less than 300 words)

As it is well known, mass transfer, which is one of the unit operations in chemical engineering, can roughly be divided into molecular diffusion and convection. Once solute concentration has become uniform, the molecules are all still in motion in different, random directions; as a result, there is nonet flux or change in concentration and the solute molecules are never at rest at temperatures above absolute zero. Triolein is a symmetrical triglyceride derived from glycerol and three units of the unsaturated fatty acid oleic acid. Triglyceride can be employed to produce biodiesel fuel by transesterification process. Triglyceride can be extracted from biomass such as rice bran or olives by the fluids such as pressurized organic solvent and supercritical carbon dioxide. To design and optimize exactly a new process using pressurized fluids, physical properties are demanded, in particular, diffusion coefficient, $D_{12}$, is indispensable to accurately understand the amount of mass transferred in the system when molecular diffusion is the bottleneck of the mass transfer [1]. However, it is difficult to measure $D_{12}$ in the pressurized fluids. In fact, there are very few reports on triolein in pressurized fluids [1,2].

Herein, the diffusion coefficients of triolein in the pressurized fluids such as carbon dioxide, hexane, methanol and ethanol were measured by the CIR method [3] and Taylor dispersion method [4] as a function of pressures from 1.0 to 31.0 MPa and temperatures from 298.15 - 333.15 K. The measured $D_{12}$ in this study were well represented by the hydrodynamic equation over a wide range of fluid viscosity.

References

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