

Measurement of Phase Equilibrium for Dimethyl Ether, and its Applications

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Abstract:

Until the end of 1990's, annual production of dimethyl ether (DME) had been about 10,000 ton/year in Japan, and DME has been mainly used for an aerosol propellant. Recently, DME cannot be synthesized only from dehydration of methanol but directly from carbon monoxide and hydrogen by use of a new type catalyst dispersed in fluids. Therefore, a pilot plant with an ability of 100 ton/day was constructed in 2004 at Kushiro, northern part of Japan. A large scale plant with an ability of 80,000 ton/year has constructed in 2008 at Nigata, the coastal city of Sea of Japan. So, a large amount of DME will be supplied in future of Japan. The physical properties of DME are similar to those of light hydrocarbons in liquefied petroleum gas (LPG), propane or butane, and the combustion properties also similar to those of gas oil. However, the solubility in water is much larger than that of propane. To utilizing DME, we have intensively investigated the physical properties, such as P-V-T relationship, vapor-pressure, vapor-liquid equilibrium (VLE), liquid-liquid equilibrium (LLE), hydrate formation, and so on. Based on the physical properties, some application was also proposed. In this symposium, at first, some activities of our research concerning phase equilibrium for DME. Successively, the fuels, as a mixture with LPG or bioalcohol, are also described. Finally, applications using DME, such as refrigerator using CO₂ and DME, extraction and purification of bio diesel fuels (BDF), and super-fast transesterification of triolein processes.

Keywords:

Dimethyl ether, Phase equilibrium, Alternative fuels, BDF