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亜臨界 - 超臨界流体 (H_2O - (CO_2) - X) の分光特性
Spectroscopic properties of sub- and supercritical fluid(H_2O - (CO_2) - X)

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Physicochemical states of H2O are divided into three phases, solid, liquid and vapor. Especially, the vapor-liquid phase boundary is called the saturated steam pressure curve. The terminated point of this curve is called the critical point. Liquid density becomes equal to gas density at that point. The fluid's state above the critical point is called supercritical fluid (water). Supercritical fluids exist near the deep-sea hydrothermal vent or in the deep earth's crust.

Supercritical fluid has a characteristic property that chemical reactivity, solubility and/or ion product. It is very important for the understandings of fluid/crustal rocks interaction. Therefore, decision of supercritical point of crustal fluid and characterization of fluid's state is very important.

The fluid near the critical point has intense density fluctuation, so, it is considered that the optical transmissivity is very low.

In present study, spectroscopic measurements for pure H2O, CO2 and C2H5OH fluids under high temperatures and high pressures up to 400 ^{o}C/30 MPa were carried out by using visible-type autoclave. It was observed the state of the optical property of the fluid near the critical point. In addition, it was considered a method for the critical point determination of multicomponent fluid by the spectral measurement of the transmitted light through the fluid. On the critical point, intensity of transmitted light though each fluid became low drastically. The minimum intensity of transmitted light was corresponded to critical temperature and pressure of each fluid. Differences between experimentally determined critical temperature and reference data in literature of pure fluids were within about 1.6 ^{o}C, and pressure differences were less than 0.3 MPa. It is practically well coincide and it is possible to evaluate critical temperature and pressure of multicomponent geofluids by using spectroscopic measurement under hydrothermal conditions.

Intensity between about 940 and 960 nm of H2O and of C2H5OH was always dark through entire temperature range in both cases of heating and cooling stages. Those absorptions in near-infrared region were corresponded to a combination of fundamental vibrations of -OH. It indicates that spectral measurement of multicomponent fluid will also lead to a further understanding of the fluid composition and the molecular structure.

キーワード: 臨界点, 超臨界流体, 分光計測
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