

Experimental Study of Critical Point Determination for Multicomponent Fluids using light-scattering Spectroscopic Method

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Geofluid is a multicomponent fluid by reaction with various crustal materials, and it is in a supercritical state under high temperature and high pressure conditions inside the Earth. It is very important to know the critical point (CP) and phase state of a geo-fluid in order to know the fluid-rock reaction mechanism under high temperature and high pressure conditions. However, it is difficult to directly determine CP of multicomponent fluid such as geological fluid and sea water by calculation using state equation (EOS) using fluid components, and it is necessary to decide experimentally.

Molecules in the supercritical fluid are unevenly distributed and are known to form both high density and sparse molecular regions in the fluid. Such nonuniformity of molecular distribution is called density fluctuation, and this degree becomes maximum at CP of fluid.

Therefore, for pure material such as H₂O and CO₂, the critical opalescence is spectroscopically observed at the subcritical to supercritical transition. Therefore, if the density variation of the multicomponent fluid can be observed by a spectroscopic method, it is possible to determine the CP value.

The objective of this study is to establish a new measurement technique / procedure for easily determining CP of multicomponent fluid using spectroscopic observation of subcritical / supercritical transition state.

Keywords: decision of critical point, multicomponent fluid, supercritical fluid, scatter spectroscopy