

NEAR AND SUPER-CRITICAL FLUIDS STUDIED USING DIAMOND ANVIL CELL AND IN SITU FT-IR SPECTROSCOPY

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NEAR- AND SUPER-CRITICAL FLUIDS STUDIED USING DIAMOND ANVIL CELL AND IN SITU FT-IR SPECTROSCOPY HU Shumin and ZHANG Ronghua, Open Research Lab. Geochemical Kinetics, Chinese Academy of Geological Sciences, Baiwanzhuang Road 26, Beijing, 100037, China. The phase relation and solution structure of water and NaCl aqueous solution have been observed and examined by using hydrothermal diamond anvil cell (HDAC) at elevated temperatures and pressures, and through in situ FT-IR spectroscopy. The temperature of observations ranges from 25 to 850°C and pressure up to 10 or to 30 kbars. At first, we observe the phase transition process from halite+liquid+vapor (H+L+V) to L+H, then to L (or supercritical fluid, SCF), and another path: (H+L+V - L+V - L (or SCF) in heating process. By visual microscope, we found that in the L+V immiscibility field, L+V are composed of ordered structure, i.e. a visual large clustering of solvent around ions. The liquid phase is manifested by vapor bubbles. When observing the phase transitions, authors examined their infrared spectra by using FT-IR microscopy simultaneously. In the case of the phase transition from liquid phase (L) to liquid + vapor (L+V) immiscibility field of NaCl solutions, a sudden change (strong frequency shift) of infrared spectra of the aqueous solution was observed near to critical temperature of water, as T were raised from 25 to 650°C. The frequency of the maximum intensity of OH symmetric and asymmetric vibration varied with respect to temperature. The sharp peak of OH stretching vibration of the maximum intensity appeared through 300 to 400°C. It indicates that the hydrogen bonding network is weakened and finally broken near to critical point of water, which causes the aqueous solution become more associated. A pressure indicator (a mineral or compound) in the HDAC was also introduced.