

EXPERIMENTAL STUDY OF WATER-ROCK INTERACTION IN NEAR & SUPER-CRITICAL STATE IN DEEP EARTH CRUST

ZHANG Ronghua, and HU Shumin

EXPERIMENTAL STUDY OF WATER-ROCK INTERACTION IN NEAR & SUPER-CRITICAL STATE IN DEEP EARTH CRUST ZHANG Ronghua, and HU Shumin, Open Research Lab. Geochemical Kinetics, Chinese Academy of Geological Sciences, Baiwanzhuang Road 26, Beijing, 100037, China. In consideration of the physico-chemical conditions, hydrothermal metal-bearing fluids came most probably from the deep earth crust and upper mantle if the critical line of the ore-forming solution (NaCl-water) was over 800°C. Investigation of the NaCl-aqueous solution in near to and in supercritical state, and its temperature lowering process would lead to discovery that there is a sudden phase separation of liquid L + vapor V while the property of supercritical fluid SCF crosses the critical state. The phase transition from SCF to L + V immiscibility field could be expressed in a P-T plot or salinity-homogenization temperature plot. It is significant that many geologists have found the most ore minerals precipitated under the chemical conditions around critical temperature of water. Fluid inclusion data of large hydrothermal mineral deposit demonstrate that the halite content and the ratio of vapor/liquid phase in fluids in the early high temperature stage is different from those in the late stage, which always expresses a process of reparation of SCF to L + V. Authors performed kinetic experiment of water/rock interaction using a multi-channel SCF flow reactor (authors design the reactor), and study the reaction process of biotite-quartz schist with water at 400°C and 40 MPa. After passed through the crushed rock, SCF was separated to L + V phase through two channels. This phase separation of L + V occurs at 150°C and 15 MPa. Authors analyzed the liquid phase sample and vapor phase sample separately. The reaction product of L and V phase is different. The vapor phase has Na, Cu, Ni, Cd, Mn, As, Ca etc., which are higher than those in primary SCF water.