# Fluorine partitioning between hydrous minerals and aqueous fluid at 1 GPa and 770 – 850 °C

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Mechanisms of volatile transfer from subducting slab to melting region beneath arc volcanoes are probably the least undrestood process of arc magma genesis. Fluorine, which suffers minimum degassing in arc primitive melt inclusions, retains the information of magma genesis at the depths. It is our interest to understand geochemical behavior of F along with other trace element, and to characterize volatile transfer from the slab to the mantle. Experimentally determined solubility of F in aqueous fluid, and partition coefficients of F between fluid and minerals provide first order information about the character of the volatile-transporting agent. Here, we report experimentally determined the solubility of F in aqueous fluid. The solid starting materials contain 5% or 1.9% F, and an approximately same amount of pure water was added right before an experiment. The experiments are conducted at 1GPa and from 770 to 850°C, for the duration of 3 to 13 days, in gold capsule, with Ni/NiO buffer, using piston cylinder high-pressure apparatus. After quenching, the liquid part is retrieved into a known volume of deionized water for the liquid analysis and the solid part is measured by an electron microprobe. We also calculate the fluid composition with mass-balance.

All samples are equilibrated with hornblende, a humite group mineral, and fluid. With mass-balance calculation a range of partition coefficents are determined: D(fluid /hornblende) = 0.13-0.42; D(fluid/norbergite) = 0.02-0.04; D(hornblendes/norbergite) = 0.13-0.17. The $D_F$ are constant over the temperature range within their uncertainties. Furthermore, F anions are preferentially incorporated into the humite group minerals than hornblende, and nearly all OH site of nobergite are occupied by F in our system. The concentration of F in the fluid is 0.22-0.78 wt% based on mass-balance, and direct analyses of fluids are under way. The F/$H_2O$ values are 10-100 times larger for primitive arc melt inclusions (0.05-0.81) than for ours (0.0024-0.0085). This suggests either 1) drastic water loss in arc melt incusions, or 2) presence of fractionation phases other than ones in this study.

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# Advances and challenges in the study of mechanisms on salinization and contamination of deep groundwater in the North China Plain

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Groundwater in deep aquifers is the main water source of households, industry and agriculture in the North China Plain (NCP). However, information on degradation of groundwater quality is often seen in this region, which poses a great threat to the intersts of society or ecosytems. This presentation reviews the recent advances in the study on mechanism of deep groundwater quality degradation over the last several decades in the NCP: salinization due to shallow saline groundwater intrusion and contamination by man-made sources. In general, degradation and deterioration of deep grouindwater quality found in the NCP was deductively explained by groundwater over-exploitation and mis-management, but the mechanism of groundwater quality degradation is largely unknown so far. As a consequence, further investigation is needed to uncover the mechanism of salinization and contamination of deep groundwater resource. Due to the compexity of the aquifers, some techniques developed for fractured rock systems [1, 2] may be used as a reference in highly heterogeneous porous aquifers, and the confronting issues and challenges can be summarized as: (i) how to address the heterogeneity of alluvial deposits including aquifers and aquitards [3]; (ii) how to characterize the spatial and temporal extent and intensity of downward salinity intrusion of shallow saline groundwater [4]; (iii) how to delineate the chemical and biochemical processes of man-made sources in aquifers [5]; and (iv) how to understand the apparent scale-effects on different hydrogeological parameters at a regional scale under field conditions [6, 7]. (Grant Nos. 2010CB428803 and 41072175)

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