In-diffusion of some chemical species in a weathered granite

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An in-diffusion experiment for some chemical species onto a weathered granite core of Φ5x 20 (cm) was carried out in a glove box under a reducing condition. After nine months, the rock samples was recovered, cut into two parts along its axis. The one part was scanned with a cyclone, a kind of autoradiographe, to identy the distrubution of radionuclide on the rock surface with the diffusional direction. The other part cut into several slices of 1cm thickness. In order to identify sorption types of the species, a sequential chemical extraction was carried out on the slices. The considered sorption types are physiosorption, ion exchange, association with ferro-manganese oxides, and incorporation into mineral structure.

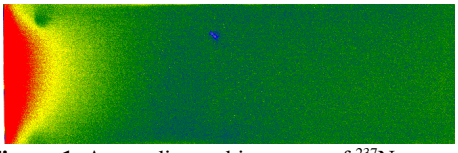

Figure 1: Autoradiographic amage of ^{237}Np

Fig.1. shows the concentration distribution of ^{237}Np on the rock surface. Np sorbed mainly within 2`3 cm and penetrated about 6 cm. Sr and Co penetrated more deeply than the other species. And some species such as Th, Cs and Eu were sorbed mainly on the contacting surface and their diffusion depth were within 3 cm.

The most interesting finding in this experiment is that the sorption mechanisms of some species were changed along their penetration depth. For examples, at the contacting surface U and Co sorbed mainly by ion exchange but association with ferro-manganese oxides became important with going into the inside of the rock. On the other hand, Np mainly associated with ferro-manganes oxides on the contacting surface and ion exchange becomes main sorption type in the deeper region.

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Study for the geochemical reaction of Bukpyong CO_2 sequestration site, Korea

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The objective of this study is to investigate the geochemical reaction of rock in Bukpyong CO_2 sequestration site, Korea. Target formations were mostly composed of porous sandstone and conglomerate beds. For the experiment, the high pressurized cell system (100 bar and 50 ºC) was designed to create supercritical CO_2 in the cell. The dissolution and precipitation of sandstone and mudstone were observed while the rock reacted with supercritical CO_2 and saline water in the cell for 30 days. Ten g of rock powder type and 50 ml of saline water were contacted with supercritical CO_2 in the cell. For the experiment, saline water was sampled from a hot-spring well (800 m in depth) in Busan. SEM-EDS analysis was conducted to measure the precipitated minerals and ICP/OES was used to quantify main compounds dissoved in solution of the high pressure cell. The mineral surface was observed by using a reflection microscope. Three locations were randomly selected on the surface and the average roughness value of those locations was measured by SPM (Scanning Probe Microscope) to investigate the change of mineral surface.

For the mudstone, concentrations of Ca^{2+}, Fe^{2+}, Mg^{2+}, Na^{2+} and K^{+} in solution increased to 348.9 mg/L, 185.2 mg/L, 134.1 mg/L, 66.9 mg/L and 7.5 mg/L, respectively, after 30 days. For the sandstone, concetrations of Ca^{2+}, Fe^{2+}, Mg^{2+}, Na^{2+} and K^{+} in solution increased to 3895.9 mg/L, 378 mg/L, 23.8 mg/L, 63.1 mg/L and 9.9 mg/L, respectively. These results suggested that ions such as Ca^{2+}, Fe^{2+}, Mg^{2+} and Na^{2+} would be significantly dissolved when it contact with the supercritical CO_2 and saline water in Bukpyong CO_2 sequestration site. The average roughness value of the plagioclase surface was 1.04 nm before the reaction, but it considerably increased to 11.26 nm after 30 days. For the orthoclase, the average roughness increased from 2.74 nm to 18.56 nm, suggesting that the dissolution of plagioclase and orthoclase occurs in active when the feldspars contact with supercritical CO_2 and saline water at Bukpyong CO_2 sequestration site.