Sorption properties of ^{60}Co, ^{152}Eu, ^{160}Tb, ^{169}Yb and ^{241}Am on Granitic Rocks

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Mobilization of radioactive elements in aquifer is essentially controlled by the geochemical and mineralogical conditions of aquifer-bearing rock. The central issue in assessing the long-term performance and saety of a radioactive waste disposal facilty is the ability to predict confidently the nature and effect of processes and geological events far into the future [1]. In this paper, we will report experiment results to compare the sorption property of REE, Am and ^{60}Co onto granitoids in acidic and neutral surface environment.

In experiments, we performed the batch experiment for 7 weeks using ^{60}Co, ^{152}Eu, ^{160}Tb, ^{169}Yb and ^{241}Am as radiotracers, and 12 kinds of fresh granitoids. And we adjusted the pHs of solutions for batch experiment to two groups, i.e. 6.8 and 5.0.

Eight samples of granitoids showed very strong sorption abilty for ^{152}Eu, ^{160}Tb, ^{169}Yb and ^{241}Am. Particularly, they sorbed more than 95% of ^{152}Eu, ^{160}Tb, ^{169}Yb and ^{241}Am within 1 week suggesting that there were equilibrated between solution and granitoid powder. Another four samples showed relatively weak sorption ability (75-85%) for ^{152}Eu, ^{160}Tb, ^{169}Yb and ^{241}Am. However, their reaction trend between solution and rock powder also suggested that they were equilibrated within 10 days. In addition, ^{60}Co show different sorption property according to the kinds of granitoids suggesting that the mineralogy and chemical composition of granitoids strongly affect the sorption property of ^{60}Co. From our experiments, we could confirm that the mineralogical and chemical composition of crystalline rocks such as granitoids was an important factor for sorption properties of radionuclides rather than specific surface area and cation exchange capacity of rock material or pH of solutions such as groundwater and surface water. Our results clearly indicate that the sorption properties between REEs and Am onto geological materials are very similar regardless of petrography, geochemical condition of groundwater.

References

[1] Chapman and Smellie, 1986, *Chem. Geol*. **55**, 167-173.