

Evaluation on isotope and component separation by diffusion experiment

*Takuma HASEGAWA¹, Kotaro NAKATA¹, Rhys Gwynne²

1. Central Research Institute of Electric Power Industry, 2. University of Waterloo

On safety assessment for radioactive waste disposal, it is important to show that groundwater flow is slow. Longer residence time makes lower radionuclide concentration because radionuclide decay with time. In a case the groundwater flow is very slow, diffusion will be the dominant transport mechanism (diffusion-dominant domain). It is a most promising condition for radioactive waste disposal. Indicating a diffusion-dominant domain, separation of component and fractionation of isotopes by diffusion will be useful index. Using rock core from Horonobe Underground Research Laboratory, diffusion experiments were conducted to confirm component separation and isotope fractionation.

The diffusion coefficients of water isotopes are three to four times higher than those of anions. The isotope fractionation factor of Cl and Br ranges 1.0017-1.0021 and 1.0007-1.0010, respectively. Moreover, effective porosity of diffusion was measured. The effective porosity for water isotope and anion is little bit different, but it will be small compared to the difference of diffusion coefficients. It is confirmed experimentally that component separation between water isotope and anion occur by diffusion. Therefore, it will be important index for the component separation of water isotope and anion, and isotope separation of Cl and Br to identify diffusion dominant domain.

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