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Research and development on groundwater dating for low permeability geological formation

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Estimation of flow of groundwater is essential for safety assessment of high level radioactive wastes (HLW). The residence time of groundwater can provide very important information for flow of groundwater, thus it is important methodology for safety assessment of HLW. For groundwater dating at low permeable geological formation, it is required to extract groundwater or target components from rock samples without changing their characteristics, because obtaining sufficient amount of groundwater is difficult. The objective of this research is to summarize and show findings and knowledge of our past researches about how to estimate (1) ion concentrations, (2) dD and d18O, (3) noble gases and (4) isotope ratios in groundwater at low permeability geological formation.
For estimation of ion concentrations, squeezing method can be applied to extract the groundwater (pore water) from rock samples. We have to take care about squeezing pressure because ion concentrations in squeezed pore water showed strong dependence on squeezing pressure.
For estimation of dD and d18O, isotopic exchange method and squeezing method are very effective. These two methods were applied to rock samples obtained in Horonobe area Hokkaido, Japan. The values obtained by two methods showed a good agreement. This result complementarily showed validity of both methods.
For estimation of noble gases in pore water, noble gases have to be extracted from pore water. We have enhanced the previous studies and developed the method to extract the noble gases without changing their characteristics.
For estimation of isotope ratios of ions dissolved in groundwater, extraction of target ions by leaching method or extraction of pore water by squeezing is effective. The dependence of isotope ratios on method or squeezing pressure is showed and appropriate method or conditions for correct estimation of isotope ratios are discussed.

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