Natural radionuclides as tracers in surface water and groundwater interaction

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Determining the relationship between rivers and adjacent groundwater systems is critical to understanding hydrogeological systems, protecting riverine ecosystems, and managing water resources. Due to its high activities in groundwater, the radionuclide ^{222}Rn is a sensitive natural tracer to detect and quantify groundwater . In this study ^{222}Rn and ^{3}H were used as a tracer in groundwater and river water interaction.

^{222}Rn and ^{3}H were used as a natural radiotracer to study groundwater and river water interaction. Study area is used groundwater as a water curtain house in winter, so shortage of groundwater problem is occurred and groundwater-river water interaction was severely varied at this time. This variation was studied with ^{222}Rn and ^{3}H during water curtain house operation period and the results was showed in figure 1 and the interation difference was compared with upper and below river dam.

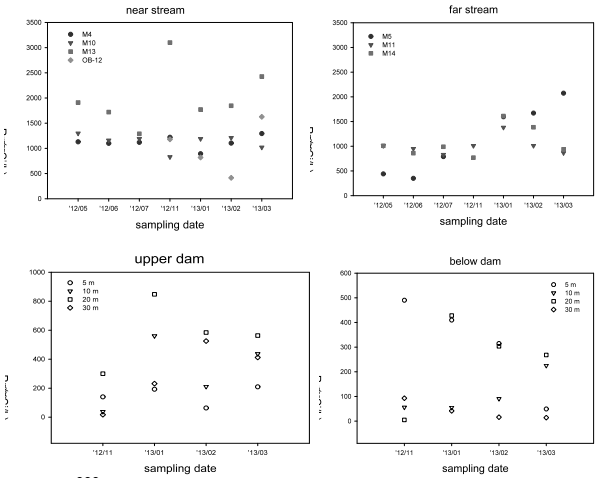

Fig. 1. ^{222}Rn contents variation with water curtain house operation period.

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Cathodoluminescence of terrestrial and extraterrestrial halite

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Luminescence of natural alkali halides such as halite and sylvite is characterized by structural defects related to F-center(+p) and V-center(+e). Their CL (cathdoluminescence), however, have not been reported so far. Since asteroidal water was discovered as fluid inclusion in halite from H5 chondrite, Monahans (1998), alkali halides in meteorites have been extensively investigated for understandings of aqueous alteration and thermal metamorphism on the parent body. Therefore, luminescence features of halides can provide valuable information on such issues. In this study we have measured CL spectra of terrestrial halite and ones in meteorites to clarify luminescence centers in various types of halite.

Several halite crystals of terrestrial origin and small halite particles in ureilite meteorites were selected for CL spectral measurements. All samples were prepared using oil while cutting and polishing without water.

All samples exhibit weak blue to greenish blue CL with broad band emissions from 350 to 650 nm. CL spectra corrected for total instrumental response were converted into energy units for spectral deconvolution using a Gaussian curve fitting. The analysis of terrestrial halite results in two emission components at 3.02 eV (410 nm) and at 2.22 eV (557 nm). Former can be assigned to F center and the latter to V center. Halite in ureilite gives two components at 3.10 eV (399 nm) for F center and at 2.61 eV (475 nm), which is different from any luminescence centers previously reported. Therefore, the emission at 2.61 eV might be defect center derived from the damage induced by high-energy radiation in cosmic space.

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