



Occurrences of Uranium and Radon-222 in Groundwaters from Various Geological Environments in the Hoengseong Area

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Groundwaters in granite, gneiss, and two-mica granite formations, including faults, in the Hoengseong area are examined to determine the relationship between their uranium and radon-222 contents and rock types. The chemical compositions of 38 groundwater samples and four surface water samples collected in the study area were analyzed. Sixteen of the samples showing high uranium and radon-222 contents were repeatedly analyzed. Surface radioactivities were measured at 30 points. The uranium and radon-222 concentrations in the groundwater samples were in the ranges of 0.02-49.3 $\mu\text{g/L}$ and 20-906 Bq/L, respectively. Four samples for uranium and 35 samples for radon had concentrations exceeding the alternative maximum contaminant level of the US EPA. The chemical compositions of groundwaters indicated Ca(Na)-HCO₃ and Ca(Na)-NO₃(HCO₃+Cl) types. The pH values ranged from 5.71 to 8.66. High uranium and radon-222 contents in the groundwaters occurred mainly at the boundary between granite and gneiss, and in the granite area. The occurrence of uranium did not show any distinct relationship to that of radon-222. The radon-222, an inert gas, appeared to be dissolved in the groundwater of the aquifer after wide diffusion along rock fractures, having been derived from the decay of uranium in underground rocks. The results in this study indicate that groundwater of neutral or weakly alkaline pH, under oxidizing conditions and with a high bicarbonate content is favorable for the dissolution of uranium and uranium complexes such as uranyl or uranyl-carbonate.

Key word: uranium, radon-222, geological boundary, groundwater, chemical characteristics, surface radioactivity