

($^{234}\text{U} / ^{238}\text{U}$) Activity Ratios Determination in Ground Water by Photon Electron Rejecting Alpha Liquid Scintillation Spectrometry

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ABSTRACT

Uranium concentration and ^{234}U to ^{238}U activity ratios in environmental water samples are important in constructing the geochemical balance of these radionuclides and understanding their behavior in the environment. And also, its radiogenic health hazard was serious. Because absorbed uranium was accumulated in bone and kidney. Therefore, USEPA recommended that uranium content in drinking water is below 30 $\mu\text{g/L}$.

Several techniques are usually used for the determination of low activities of uranium in the environmental samples. These techniques include radiochemical methods, fluorometry, mass spectrometry etc. The mass spectrometer provides high sensitivity in the measurement of uranium isotopes of ^{234}U and ^{238}U . Its high cost, however, make it difficult to use the equipment for analysis of environmental samples. Alpha spectrometry with semiconductor detectors is another sensitive technique, but it has complicated sample preparation procedures. Alpha liquid scintillation by PERALS spectrometry provides an attractive method for measuring alpha particles. PERALS coupled with solvent extraction method has advantage of fast sample preparation, good sensitivity, radionuclide selectivity. Uranium concentrations and isotope ratios were determined by PERALS. For the analysis of uranium, extractive scintillation cocktail solution URAEXTM was used. The activity ratio of ^{234}U to ^{238}U was investigated some groundwater in Daejeon and Gumsan area. The results show ratio variation from 0.87 to 5.25. The Uranium analysis procedure and uranium ratio results in groundwater are presented in Fig1 and table 1 respectively.

Key words: Uranium ratio, groundwater, PERALS

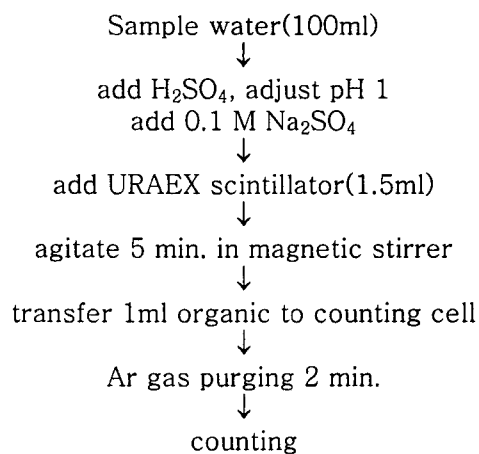


Fig. 1. Uranium analysis procedure

Table 1. Uranium activity and ²³⁴U/²³⁸U activity ratio in Daejeon and Grumsn groundwater

sample	²³⁸ U(pCi/L)	²³⁴ U/ ²³⁸ U	sample	²³⁸ U(pCi/L)	²³⁴ U/ ²³⁸ U
1	22.1	1.12	10	94.0	1.19
2	15.8	1.40	11	190.8	1.55
3	138.2	1.02	12	58.4	1.42
4	13.7	1.23	13	63.6	0.97
5	30.8	0.87	14	22.4	1.33
6	47.3	1.08	15	35.7	1.13
7	21.2	1.29	16	0.95	4.26
8	11.6	1.07	17	1.49	5.25
9	86.3	1.06			