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## Radiological Characterization of a low and intermediate-level Radioactive Waste Samples from Research Reactor

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The radioactive solid wastes from research reactor and facilities consist of soft wastes, disassembled equipment, laboratory supplies used during research activities, filters and ion exchange resins used in the purification of gas and liquid effluents, and other various type of combustible materials. According to the regulation for low and intermediate-level radioactive wastes in Korea, gross alpha,  $^3\text{H}$ ,  $^{14}\text{C}$ ,  $^{55}\text{Fe}$ ,  $^{59}\text{Ni}$ ,  $^{63}\text{Ni}$ ,  $^{90}\text{Sr}$ ,  $^{94}\text{Nb}$ ,  $^{99}\text{Tc}$ ,  $^{129}\text{I}$ , and gamma emitters (e.g.,  $^{58}\text{Co}$ ,  $^{60}\text{Co}$ ,  $^{94}\text{Nb}$ ,  $^{137}\text{Cs}$ , and  $^{144}\text{Ce}$ ) should be quantitatively determined for the disposal treatment.

In this study, analytical procedures were developed to quantitatively determine the radio-nuclides for the various type of radioactive solid waste samples. In the case of radioactive soft wastes, it is difficult to obtain the representative in the whole sample volume due to inhomogeneity for the radionuclide's contamination. Therefore, in order to assure the homogeneity of the sample, the whole samples were cut and mixed repeatedly. The process of sample preparation and measurement is composed of four main processes: direct measurement (gamma emitters), alkali digestion ( $^{129}\text{I}$ ), acid digestion ( $^3\text{H}$  and  $^{14}\text{C}$ ) and sequential separation and purification using extraction chromatography (e.g., TRU: gross alpha and U isotopes, DIBK resin:  $^{55}\text{Fe}$ , Ni resin:  $^{59}\text{Ni}$  and  $^{63}\text{Ni}$ , SR resin:  $^{90}\text{Sr}$ , and TEVA resin:  $^{99}\text{Tc}$ ). The validated process were applied to radiological characterization for the combustible waste samples from HANARO research reactor and facility of KAERI. The validation results used the standard spiked samples revealed that the methods could be applied for rapidly and satisfactorily recovering the specific target nuclides from samples with a high degree of accuracy and precision.

**Primary author:** Dr LIM, Jong Myoung (KAERI)

**Presenter:** Dr LIM, Jong Myoung (KAERI)

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