MASS SPECTROMETRIC MEASUREMENT OF URANIUM ISOTOPES AND DISTRIBUTION COEFFICIENT IN FUKUSHIMA CONTAMINATED SOILS

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Earthquake of magnitude 9.0 followed by Tsunami on 11 March 2011 caused nuclear accident at the Fukushima Daiichi Nuclear Power Plant (FDNPP). This resulted radioactive contamination due to deposition of mainly radiocesium as well as many long-lived radionuclides surrounding the area. Depending upon environmental conditions, radionuclides can be mobilized in aquatic systems. Therefore, the fate and transfer of these radionuclides in the soil water system is very important for radiation protection and dose assessment. In the present study, soil and water samples were collected from contaminated areas around FDNPP. Inductively coupled plasma mass spectrometry (ICP-MS) is used for total uranium concentration and thermal ionization mass spectrometry (TIMS) has been used for uranium isotopes measurement. Extraction chromatography has been used for the separation of uranium. Activity ratio, $^{234}U/^{238}U$ ratio measured in spiked solution by MC-ICP-MS and non-spiked aliquot using TIMS were compared. Both measured values were in good agreement within 95% accuracy. We have observed, isotope ratio $^{235}U/^{238}U$ is of natural origin, $^{234}U/^{238}U$ (activity ratio) as a base line study and in a few soil samples ^{236}U has been detected. For the migration behavior, its distribution coefficient (K_d) has been determined using laboratory batch method. Chemical characterization of soil with respect to different parameters has been carried out in order to explain the radionuclide mobility in this particular area [1]. There is a variation with uranium activity ratio where as no enrichment of ^{235}U has been noticed in the studied area. However, contaminated water used for cooling the reactor vessel stored near the reactor after accident, may contain radioactive uranium. This study will be helpful for prediction of radionuclide migration in the contaminated site.

References

[1] Mishra S., Sahoo S.K., Arae H., Watanabe Y., Mietelski J.W. J Chromatogr Sep Tech 5: 1000250. Doi: 10.4172/2157-7064.1000250 (2014)