

Radioactive particles in residual soil after strong acid leaching

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In March 2011, the Fukushima Dai-ichi Nuclear Power Plant (F1NPP) accident has been occurred, and consequently large amount of radionuclides discharged to the environment. Especially Cesium-137 (¹³⁷Cs), which is radioisotope of cesium and it has 30 a of half-life, were remained in the environment for a long time. Understanding of the physical and chemical properties of the emitted radioactive cesium is important to accurately evaluate the possible human health impacts and to assess the long-term distributions of these radionuclides after deposition in residential areas, agricultural fields, mountains, and aquatic environments. Especially, the chemical form in soils is interesting at the point of decontamination of residence area and reconstruction of agricultural field. This study also analyzed chemical form of radiocesium in the soil collected at Motomiya city.

Soil sample was collected at the Motomiya city, Fukushima Prefecture, located of 40 km west from the F1NPP in October 2012. Concentration of ¹³⁷Cs in soil was 8 kBq/kg (In March 11, 2011). Sequential extraction was performed (Five fraction was obtained, 1) water dissolve, 2) cation exchangeable, 3) organic form, 4) concentrated acid leachable, 5) residue.), and approximately 50% of ¹³⁷Cs was remained in soil. Several number of spot type contamination were detected with autoradiography using an imaging plate. A spot was isolated from soil, and it was spherical particle. Constitution elements are Fe, Zn, Si, O, as well as Cs, which was detected using an energy dispersive X-ray spectrometry. These features are very similar to Cs-bearing radioactive particles isolated from air dust filter collected at the Tsukuba city by Adachi et al. (2013) and Abe et al. (2014). Therefore the particles distributed widely. In addition, dominant composition of particle is silicate of approximately 80 %. This result is consistent with Satou et al. (2015) and Yamaguchi et al. (2016). A silicate usually indicates acid resistance. These results suggested that the particulate form radiocesium is stable in environment, and it could be not remove by acid chemical treatment.

Keywords: Radioactive particle, Silicate compound, Acid resistance