

Original

Estimation of the Time of Cesium Leaking by Moisture Absorption of Radiologically Contaminated Municipal Solid Waste Incinerator Fly Ash

Tsuneki ICHIKAWA^{1,2*}, Kazuo YAMADA², and Masahiro OSAKO²

¹Hokkaido University (Home address: 8-1-27 Tonden 3, Kita-ku, Sapporo, Hokkaido 002-0853, Japan)

²National Institute for Environmental Studies (16-2 Onogawa, Tsukuba, Ibaraki 305-8506, Japan)

Summary

For estimating the time of cesium leaking from municipal solid waste incinerator fly ash (MSWI FA) containing deliquescent salts and radioactive cesium that had been released by Fukushima Daiichi Nuclear Accident, the rate of moisture absorption of MSWI FA from the atmosphere was measured by changing temperature, relative humidity, bulk density, the contents of CaCl₂, NaCl, KCl and pre-absorbed water, and the shape and the structure of the container. The experimental results were summarized with simple mathematical equations which enable one to determine the time period for the leaking from MSWI FA stored in a container under varying temperature and humidity. It was found that the leaking starts when all the pores in the FA are filled with an aqueous solution generated by the moisture absorption, and the time of the leakage is possible to be estimated by solving a simple diffusion equation. The estimated time was more than 11 years for one cubic meter of MSWI FA stored in an air-permeable flexible container under the field condition near Fukushima Daiichi nuclear power plants.

Key Words: Municipal solid waste incinerator fly ash, Fukushima Daiichi Nuclear Power Plant accident, Radioactive cesium leaking, Deliquescent salts, Moisture absorption
