



PRESS RELEASE (2018/07/06)

### Novel Method of Quantifying Cesium-rich Microparticles released from Fukushima Daiichi Nuclear Power Plant (FDNPP)

During the Fukushima Daiichi nuclear disaster, the damaged reactors released not only volatile caesium but also the radioactive glassy particles, termed caesium-rich micro-particles (CsMPs). The particles are typically a few micron in diameter, scarcely dissolve in water, and have radioactive density as high as  $\sim 10^{11}$  Bq/g. Thus, the CsMPs cause a fear of long-term health risks to humans if inhaled; however, the amount and distribution of CsMPs in the contaminated environments remained uncertain.

Mr. Ryohei Ikehara (M2 student) and a team lead by Dr. Satoshi Utsunomiya of Department of Chemistry developed a new method to quantify the CsMPs in surface soils collected from the regions surrounding the FDNPP based on autoradiography, which we call "quantification of CsMPs (QCP)". This is a result of international collaborative research with Tsukuba University, Tokyo Institute of Technology, University of Manchester, University of Nantes, and Stanford University.

In the QCP method, photo-stimulated luminescence (PSL) in autoradiography is linearly correlated to the radioactivity of various microparticles, with a regression coefficient of 0.0523 Bq/PSL/h. CsMPs were detected in soil sieved with a 114- $\mu$ m mesh. There was no overlap between the radioactivities of CsMPs and clay particles adsorbing Cs (Fig. 1). Based on the distribution of radioactivity of CsMPs, the threshold radioactivity of CsMPs in the size fraction <114  $\mu$ m was determined to be 0.06 Bq. The number and radioactivity fraction of CsMPs in four surface soils collected from the vicinity of the FDNPP were determined to be 48–318 particles/g and 8.53–31.8%, respectively (Fig. 2).

"This novel method is critically important and can be used to quantitatively understand the distribution and migration of the highly radioactive CsMPs in near-surface environments surrounding the FDNPP" says Utsunomiya.

The paper, *'Novel Method of Quantifying Radioactive Cesium-Rich Microparticles (CsMPs) in the Environment from the Fukushima Daiichi Nuclear Power Plant'* has been published in *Environmental Science & Technology* – DOI:10.1021/acs.est.7b06693

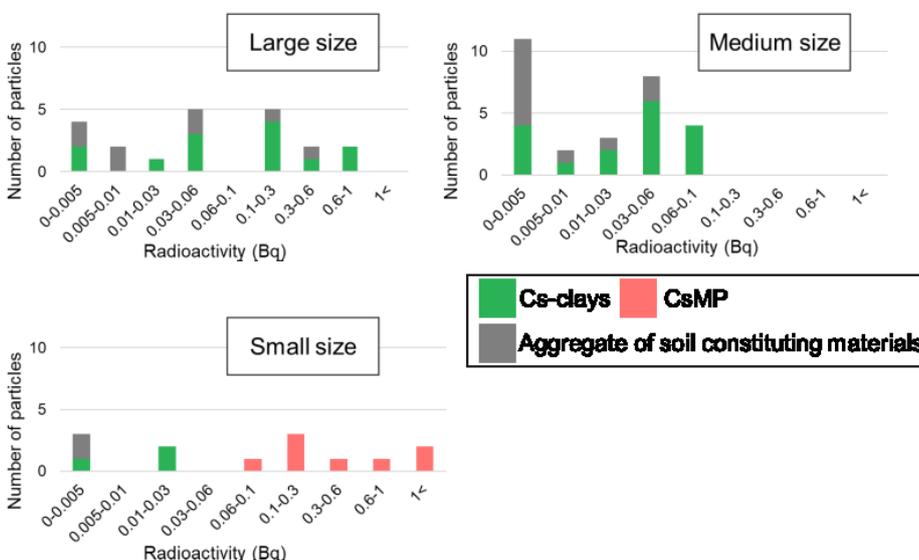


Figure 1. Histogram of the CsMP and Cs-clay distributions for three size fractions. Large, medium, and small size fractions are >597, 114–597, and <114  $\mu$ m, respectively.

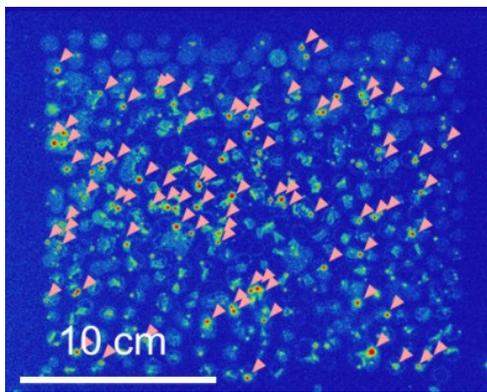


Figure 2.  
Autoradiography of the soil sieved with 114  $\mu\text{m}$  mesh.  
The pink arrows indicate the presence of CsMPs

---

**【Contact】**

Satoshi Utsunomiya, Associate Professor  
Department of Chemistry  
Tel : +81-92-802-4168 / Fax : +81-92-802-4168  
Email : [utsunomiya.satoshi.998@m.kyushu-u.ac.jp](mailto:utsunomiya.satoshi.998@m.kyushu-u.ac.jp)