



PRESS RELEASE (2018/02/28)

Discovery of uranium dioxides released from the Fukushima Daiichi Nuclear Power Plant

A large amount of radionuclides were released from the Fukushima Daiichi Nuclear Power Plant (FDNPP) during the meltdowns after the great east Japan earthquake in March 2011, and the Uranium speciation remains unknown.

Ms. Asumi Ochiai (M2 student) and a team lead by Dr. Satoshi Utsunomiya of Department of Chemistry have uncovered and succeeded, for the first time, in the atomic-scale analysis of debris nano-fragments released from the FDNPP into the environment, which is a mixture of the nuclear fuels and the structure materials. This is a result of international collaborative research with Tsukuba University, Tokyo Institute of Technology, University of Manchester, University of Nantes, and Stanford University.

“We discovered nano-fragments of an intrinsic U-oxide nanoparticles closely associated with radioactive cesium-rich microparticles collected within 4 km from the FDNPP,” says Utsunomiya. “They are UO_{2+x} and isometric $(U,Zr)O_{2+x}$ with the $U/(U+Zr)$ molar ratio ranging from 0.14 to 0.91. The results indicated the heterogeneous physical and chemical properties of debris at the nanoscale, reflecting the complex thermal processes within the FDNPP reactor during the meltdowns. The meltdown processes were partially unraveled, but we still need to obtain more information until the day when the real debris is safely removed.” For further information, see “Uranium Dioxides and Debris Fragments Released to the Environment with Cesium-Rich Microparticles from the Fukushima Daiichi Nuclear Power Plant”, *Environmental Science & Technology*, Ochiai et al., DOI: 10.1021/acs.est.7b06309

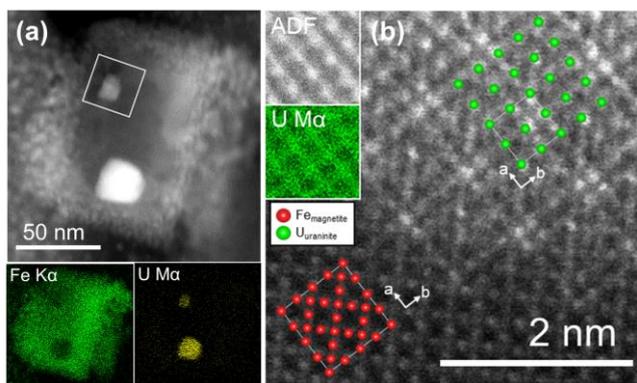


Fig. 1. (a) HAADF-STEM image of the Fe-U particle and the elemental maps. (b) High-resolution HAADF-STEM image of the area indicated by the white square in panel (a). Fe atoms (red) of magnetite structure and U atoms (green) of uraninite structure are overlaid in the image.

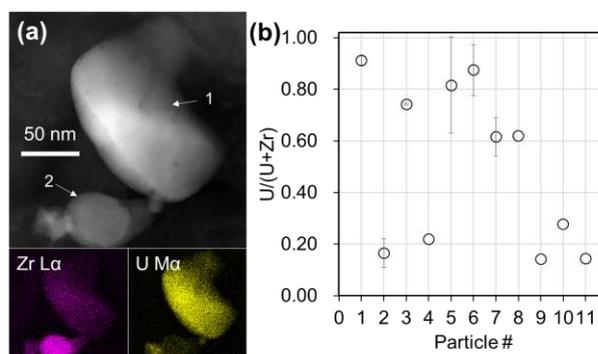


Fig. 2. (a) HAADF-STEM image of U-Zr-oxide nanoparticles with the elemental maps. (b) The molar ratios of $U/(U+Zr)$ analyzed using STEM-EDX. The error bars show the standard deviations (2σ).

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