

**On-site Report**

**High Radiation Soil “Black Soil” Generated in the Fukushima Daiichi Nuclear Power Plant Accident and the Cause of the High Radiation: Details of Radioactive Cesium Concentration in Smectite**

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● **Summary** ● Dark dirt along with extraordinarily high radiation, referred often as “Black Soil”, occurs as patches in hollows on roads, parking lots, residential quarters, and lawn and grass lands in Fukushima. The patches appear suddenly after rain and often disappear in few weeks. The surface is very fine-grained with the silk luster and characterized by the development of hexagonal sun cracks. The dirt consists of clay minerals including smectite and organic matter as well as grains of quartz, feldspars, amphibole and biotite, and contains radiocesium  $^{137}\text{Cs}$  and  $^{134}\text{Cs}$ . Studies were undertaken to examine the influence of smectite on the uptake of radiocesium. X-ray diffraction and XRF analysis of smectite indicated that Cs, unlike K, in the interlayer space was hardly removed even by the conventional ion-exchange experiment with 1M- $\text{CaCl}_2$  solution. This suggests that Cs taken once into clays by ion exchange with rainwater is not removed on the next ion-exchange with rainwater. The high affinity of Cs toward smectite caused selective and gradual uptake of Cs from environment. Micrometer-sized clay minerals are normally blown away by wind and/or washed away by rainwater. They, however, can aggregate with organic matter and deposit in a pool ball on ground. Such pool balls became the patches of dark dirt by drying-up.

**Key Words:** soil contaminated with radioactive materials, radioactive cesium, Fukushima Daiichi Nuclear Power Plant, smectite, interlayer cation

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Received October 18, 2020; Accepted December 21, 2020

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