Cs adsorption/desorption behavior of weathered biotite at actual concentration level in Fukushima

H. MUKAI[1]*, S. MOTAI[1], K. TAMURA[2], T. YAITA[3] AND T. KOGURE[1]

[1]University of Tokyo, Tokyo, Japan (*correspondence: hmukai@eps.s.u-tokyo.ac.jp)
[2]National Institute of Material Science, Tsukuba, Japan
[3]Japan Atomic Energy Agency, Hyogo, Japan

Since the accident of Fukushima nuclear plant in 2011, a number of studies have been carried out to clarify the adsorption state of radioactive cesium (Cs) in the contaminated soil. Recently, the Cs adsorption experiments for various clay minerals considering actual contaminated conditions in Fukushima were conducted by using ^{137}Cs radioisotope and imaging plate (IP) autoradiography [1]. The experiments revealed that ^{137}Cs was predominantly sorbed into weathered biotite (WB) compared to the other clay minerals. In the present study, further Cs adsorption/desorption experimetns of WB have been carried out, as well as those of zeolite for comparison.

The WB used in this study was collected from Fukushima. The zeolites (mordenite and clinoptilolite) were donated by Dr. Y. Watanabe, Kanazawa Institute of Technology. The samples of the WB and the zeolites were sieved to 25-53 μm in size and immersed in ^{137}Cs solutions of 50 μl (10^{-11} to 10^{-9} M). Subsequently, the ^{137}Cs sorbed particles were reacted with various electrolyte solutions such as CH_3COONH_4 (1 molL^{-1}), CsCl (1 molL^{-1}), $Mg(NO_3)_2$ (1 molL^{-1}) and HCl (0.1 molL^{-1}). The changes of the radioactivities in the particles between the treatments were examined using IPs.

The adsorption ability was almost similar between the WB and zeolites. On the other hand, ^{137}Cs sorbed in WB was hardly desorbed by ion-exchange with the CH_3COONH_4 and CsCl solutions, whereas ^{137}Cs sorbed in zeolites was easily desorbed. It was also found that the sorbed ^{137}Cs in WB was slowly eluted with the $Mg(NO_3)_2$ and HCl solutions. These results suggest that the radioactive Cs adsorbed by WB is remarkably stable in the environment of Fukushima, and WB has a potential to be utilized as a Cs adsorbent for specific purposes.

[1] Mukai et al. (2016) Sci. rep. **6**, 21543.