

## **Effect of solution composition on cesium desorption of phyllosilicates with different stacking structure**

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The behavior of Cesium desorption on phyllosilicates with different stacking structure was investigated using three types of solution. Three phyllosilicates were used: vermiculite (Ver), montmorillonite (Mont) and weathered biotite (WB), being the latter one chemically treated to obtain different stacking structures with the same chemical composition. On the one hand, to increase the expandable layer, WB was treated using Na-TPB (TPB-WB) and alkylammonium ion (Alkyl-WB). On the other hand, a K-exchange treatment (K-WB) was carried out to decrease the expandable layer. XRD was used to estimate the ratio of the expandable layer in the samples, which showed the following order: Mont = Ver > Alkyl-WB > TPB-WB > WB > K-WB. In the sorption experiments, each sample was dispersed in  $10^{-3}$  M CsCl solution (sample/solution = 1/100) and the amount of adsorbed Cs was evaluated. In the desorption experiments, 1 M  $\text{NH}_4\text{Cl}$  solution (SN0) and two simulated soil pore solutions, including Na, Ca, Mg, K and  $\text{NH}_4$  (SS1 and SS2), were used. Total cation concentrations of SS1 and SS2 were 0.073 M and 0.158 M, and the ratios of (K,  $\text{NH}_4$ )/(Na, Ca, Mg) were 1.71 and 0.09, respectively. The solid phases after the sorption experiments were dispersed 5 times, and the total amount of desorbed Cs from the solid phases was estimated.

The amount of adsorbed Cs on the samples followed this order: Alkyl-WB = TPB-WB  $\approx$  WB > Mont > Ver > K-WB. Cs desorption on Ver and WB was independent of the total aqueous cation concentration, while it seemed to depend on the concentration of K and  $\text{NH}_4$ . Cs in Ver and WB was difficult to desorb in solutions with high content of K and  $\text{NH}_4$  (SN0 and SS1). Likely, it would be caused by the change of the stacking structure during K and  $\text{NH}_4$  sorption. Since the adsorption sites with high Cs affinity were generated by chemical pretreatments, desorption of adsorbed Cs on TPB-WB and Alkyl-WB was substantially limited. Almost all adsorbed Cs in K-WB was desorbed regardless the type of solution. Desorption of adsorbed Cs in Mont was dependent on the total cation concentration of the solutions, and 70~80% of adsorbed Cs was desorbed.