Cation adsorption ability. The adsorption strength of Na⁺ on montmorillonite is influenced by the cations residing in it, which will, in turn, affect its behavior. The interlayer spacing of montmorillonite increases in the presence of Cs⁺, an ion that is widely known to bind to soils. In addition, montmorillonite in the presence of Cs⁺ likely results from the dehydration of Na⁺ in the collapsed interlayer space. Yayu will determine the hydration state of adsorbed Na⁺ by using nuclear magnetic resonance spectroscopy. This study will help improve our understanding of the cation adsorption mechanisms on montmorillonite.

STUDENT RESEARCH SPOTLIGHT

Congratulations to Yayu Li (University of Connecticut, USA) for winning the 2018 CMS Student Research Grant!

Yayu Li’s work uses $^{23}$Na NMR spectroscopy to study cation adsorption on montmorillonite. Montmorillonite plays a critical role in cation retention in soils, which is directly related to soil health and safety. The cation adsorption process in montmorillonite is complex, because the clay is expansive. The interlayer spacing of montmorillonite is influenced by the cations residing in it, which will, in turn, affect its cation adsorption ability. The adsorption strength of Na⁺ on montmorillonite increases in the presence of Cs⁺, an ion that is widely known to cause clay collapse. According to the nanopore inner-sphere enhancement effect (which states that cations tend to dehydrate in constrained adsorption sites), the enhanced adsorption strength of Na⁺ on montmorillonite in the presence of Cs⁺ likely results from the dehydration of Na⁺ in the collapsed interlayer space. Yayu will determine the hydration state of adsorbed Na⁺ by using nuclear magnetic resonance spectroscopy. This study will help improve our understanding of the cation adsorption mechanisms on montmorillonite.

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