



Stable Strontium Isotopic Fractionation During Sorption onto Magnetic Nano-Humid Acid Coated Iron Oxide Particles

H.-C. Liu, C.-F. You, and Y.-J. Tu

Department of Earth Sciences, National Cheng Kung University, Tainan 70101, Taiwan (hslmax@gmail.com)

The mobility of strontium (Sr) through hydrological systems is critically governed by sorption reactions of solid phases such as iron oxides and clay minerals. Inorganic precipitated and bacteriogenic iron oxides are widespread in marine and fresh systems fed by iron-rich supplies, which may impact the global Sr cycle. A series of laboratory batch experiments of Sr sorption onto humid acid coated magnetic nano iron oxides using high purity in-house standard were performed in this study and aimed for gaining a better understanding of mechanisms controlling Sr mobility. The results indicate that Sr sorption is a function of pH, 100 % Sr remains unbound at pH <4 and more than 85 % absorbed at pH >8. Temperature controlled experiments in the range of 5 - 35 degrees C indicate a positive relationship between sorption capacity and temperature. Measurements of stable Sr isotopes ($\delta^{88}\text{Sr}$ and $\delta^{87}\text{Sr}$) in batch experiments show that lighter isotopes reacted preferentially with iron oxides, and a negligible pH effect on isotopic fractionation. To calculate the degree of the kinetic isotope effect, Rayleigh fractionation model is applied to evaluate the isotope fractionation factor, α is 0.99985 at pH 8.17 (equals to $\Delta^{88}\text{Sr} \sim 0.15 \text{ ‰}$). Temperature exerts only minor isotopic fractionation effect and reveals more importance at lower temperatures. This new finding provides crucial information for a detail evaluation of sorption processes in natural environments.