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Antimony Isotope Fractionation during Microbial Reduction of Antimonate by *Desulfuribacillus stibiiarsenatis* MLFW-2

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The redox transformations of antimony (Sb) play a big role in the cycling, mobility, and bioavailability of Sb in the environment. Sb(V) is very soluble and mobile, while Sb(III) is sparingly soluble and relatively immobile. The reduction of Sb(V) to Sb(III) therefore causes immobilization of Sb and can be a potential remediation strategy. Isotope ratio measurements can serve as an indicator of redox reactions and contaminant immobilization. In this study we show that the reduction of Sb(V) is a kinetic isotope effect, and we quantified the isotopic fractionation associated with the reduction of Sb(V) by *Desulfuribacillus stibiiarsenatis* MLFW-2 in environmentally relevant conditions. This was achieved by performing batch experiments for microbial reduction of Sb(V) in an artificial freshwater medium. In our experiments, Sb(V) was reduced to Sb(III) by 59% to 85%. The magnitude of isotopic fractionation for the four experiments ranged from -0.93 ± 0.12‰ to -1.06 ± 0.18‰ with an average value of -0.98 ± 0.12‰ (n = 4, 2σ). This isotopic fractionation is two times larger than the fractionation associated with reduction by potassium iodide or sulfide at circumneutral pH [1,2]. However, adsorption of Sb has been shown to fractionate Sb isotopes significantly and this may complicate interpretation of Sb isotope data if the small fractionations we observed for reduction are found to occur widely in nature [3,4]. Improving our knowledge of Sb isotope shifts expected in natural systems may lead to successful use of $\delta^{123}Sb$ to track immobilization of toxic Sb via reduction reactions. Similarly, Sb isotope shifts in ancient rocks may provide evidence for changes in the global Sb redox cycle caused by evolving atmospheric O_2, marine anoxic or euxinic events.

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