

Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Tungsten isotope fractionation during adsorption to common soil substrates

LAURA WASYLENKI¹, AUGUSTUS SCHAEFER¹

¹Department of Earth and Atmospheric Sciences, Indiana University, Bloomington, IN 47405 USA

The environmental mobility of tungsten (W), a likely carcinogen, is primarily governed by adsorption onto soil and sediment particles [1]. Tungsten stable isotopes, in combination with reactive transport modeling, may prove useful for tracking the extent to which adsorption is attenuating flow in contaminant plumes and for assessment of the effectiveness of engineered permeable reactive barriers. But success with these endeavors will depend critically on fundamental understanding of exactly how interactions between aqueous tungsten species and common substrates govern tungsten isotope distribution.

We have investigated tungsten isotope fractionation during adsorption to synthetic Fe- and Mn-oxyhydroxides at *pH* 8 and *pH* 5 (ferrihydrite and birnessite). Except in the case of birnessite at *pH* 5, we observed an equilibrium isotope effect with lighter isotopes preferentially adsorbed and a magnitude of $\Delta^{183/182}\text{W} = 0.3$ to 0.4 ‰. For birnessite at *pH* 5, the fractionation we observed varies from 0.3 to 0.7 ‰ with increasing fraction of tungsten adsorbed.

These results are somewhat similar to those previously published for molybdenum, which is tungsten's upstairs neighbor in Group 6, in that lighter isotopes are preferentially adsorbed, while heavier isotopes remain in solution. In contrast, however, the W results are very nearly the same for adsorption on both Fe- and Mn-oxyhydroxides, whereas Mo isotopes exhibited a much larger fractionation during adsorption on Mn- than on Fe-oxyhydroxide surfaces [2,3]. In addition, X-ray absorption near-edge spectra for W adsorbed to these two substrates at both *pH* values appear to be nearly identical. The spectra indicate that adsorbed tungsten is in distorted octahedral coordination with oxygen, while aqueous tungsten is tetrahedrally coordinated. We infer that this contrast in coordination environment drives the observed fractionation. Our results are similar to those in a very recent paper by another group [4], but some important differences will be highlighted in this presentation.

[1] *e.g.*, Clausen et al. (2004). *Env. Poll.* 129, 13-21.

[2] Wasylenki et al. (2008) *GCA* 72, 5997.

[3] Goldberg et al. (2009) *GCA* 73, 6502.

[4] Kashiwabara et al., (2017) *GCA* 204, 52.