Factors Influencing Tungsten Mobility in Soils from Fallon, Nevada

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Tungsten (W) was recently classified by the EPA as an emerging contaminant. The EPA did this in response to W being implied as a possible factor in childhood leukemia cases in Fallon, Nevada. An increase in W research has resulted from these cases, as W may have previously unrecognized toxicological effects [1][2]. Field studies have shown that W is mobile in the environment [3], but there is still a paucity of knowledge about the actual behavior of W and the processes that control W transport. By analyzing the occurrence of W in Fallon sediments, it was possible to understand how W becomes mobilized after deposition.

To characterize W in sediments several techniques were used including total digestions, sequential extractions, water soluble extractions, and solid state W speciation using synchrotron methods. From these approaches a conceptual W mobilization pathway was constructed following the deposition of metallic W from air particulates onto sediments. Tungsten metal is oxidized forming WO_3. Once WO_3 comes into contact with water, WO_4^{2-} is formed and released. Our results show less W associated in the exchangeable phase with increasing depth and greater association with Mn-oxide with increasing depth. These results suggest that as WO_4^{2-} migrates downward through the soil, it is sequestered by oxide phases through surface sorption reactions. Tungsten speciation is highly variable, and poly-WO_4^{2-} species are less likely to be sequestered through sorption reactions. This leads to two potential pathways where WO_4^{2-} is sequestered or polymerized, remaining mobile.

[1]Witten *et al* (2012) *Chem-Bio Interactions* **196**, 87-88. [2] Strigul *et al* (2005) *Chemo* **61**, 248-258. [3] Johannesson & Tang (2009) *J. Hydro* **378**, 13-28.