Microbial transformation of Sb-bearing rocks

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China contributes 84% antimony production of the world. Xikuangshan antimony mine is the largest antimony deposit worldwide with over 100 years' mining history, which results in the high accumulation of antimony in surrounding soils, sediments and water bodies (He et al., 2012). Although microbes have been demonstrated to play a fundamental role in metal and metalloid geochemical behaviors in natural environments, the knowledge about the microbial transformation of Sb-bearing rocks remained limited to date.

We isolated a bacterial strain from the tailings at Xikuangshan antimony mine to investigate the interaction between bacteria and antimony ore rocks. Resutls showed that the isolated strain, identified as *Paraccocus versutus* XT0.6, was able to oxidize dissolved Sb(III) aerobically and anaerobically. It can also dissolve antimony ore rocks via increasing pH during its growth and quickly oxidize the released Sb(III) to Sb(V) completely. X-ray diffraction ananlysis revealed that stibnite (Sb_2S_3) was the main mineral phase in the ore rocks with minor proporton of quarts and calcite. After the interaction with XT0.6, the content of stibnite decreased in the biotic experiments with the formation of secondary Sb(V)-containing mineral mopungite [$NaSb(OH)_6$]. On the contrary, pH increase in abiotic controls enhanced the chemical release and oxidation of Sb(III) in the ore rocks. However, neither complete oxidation of Sb(III) nor secondary Sb(V) mineral was observed under abiotic conditions. Our results confirmed that the pristine bacteria are actively involved in the release of Sb(III) from Sb sulfide minerals, complete oxidation of dissolved Sb(III), and the formation of secondary Sb(V)-bearing minerals (Loni et al., 2020). These results enhance our understanding about microbial role in the biogeochemical behaviors of antimony in mining area.

He M., Wang X., Wu F., Fu Z., Antimony pollution in China. Sci. Tot. Environ.2012, 421-422, 41-50.

Loni C. P., Wu M., Wang W., Wang H., Ma L., Liu C., Song Y., Tuovinen O. H., Mechanism of microbial dissolution and oxidation of antimony in stibnite under ambient conditions. J. Hazard. Mater. 2020, 385,121561.