

Insights in the secondary mineralogy of antimony

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Antimony enters the environment mostly through mining activities or owing to the disposal of antimony-containing products. In both cases, minerals which incorporate this element can strongly limit its mobility. One of the most efficient minerals of this kind is tripuhyite; with its flexible, defect-rich structure, it can widely deviate from the nominal composition FeSbO_4 and accommodate great range of Fe/Sb ratios. We are finding tripuhyite as an inconspicuous phase essentially everywhere Sb-containing ores or waste forms are weathering. The compositional field of tripuhyite in the Fe-Sb-As ternary passes gapless into the field of Sb-containing goethite. Given that such goethite may contain Sb_2O_5 even in excess of 10 weight %, this Sb must be an integral part of its structure, not just an adsorbed species. At lower load of Sb(V), the predominant aqueous species $\text{Sb}(\text{OH})_6^-$ is adsorbed onto the surfaces of iron oxides, as are many other anions.

Tripuhyite is commonly accompanied by pyrochlore-type phases with general composition $(\text{Ca,Pb,Sb}^{3+})_2\text{Sb}^{5+}_2\text{O}_6(\text{O,OH})$. In open systems with circumneutral fluids, however, we observe massive precipitation of brandholzite, $\text{Mg}[\text{Sb}(\text{OH})_6]_2 \cdot 6\text{H}_2\text{O}$, even though calcium is abundant and the pyrochlore-type phases should be preferred.

The recent discovery of new antimony sulfoxides, e.g., ottensite, $(\text{Na,K})_3\text{Sb}_6^{3+}(\text{Sb}^{3+}\text{S}_3)\text{O}_9 \cdot 3\text{H}_2\text{O}$ [1], indicates that the mechanisms of Sb weathering and the intermediate species are still not well known and offer new fields to explore.

[1] J. Sejkora, J., Hyršl, J., (2007): *Mineralogical Record* **38**, 77-81.