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News

Characteristic of the arsenic concentrations in travertine at Hirano springs in Kawanishi City, eastern part of Hyogo Prefecture

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Abstract

The Reddish-brown and white travertine are formed at Hirano springs in Kawanishi City, eastern part of Hyogo Prefecture, Japan. The spring water contains very high concentration of arsenic. ED-XRF and XRD analyses show that the reddish-brown travertine is mainly amorphous iron compound. On the other hand, white travertine is mainly calcite. EDX analysis showed high arsenic concentration in the reddish-brown travertine. EPMA analysis shows that the arsenic is concentrated especially in the dark brown part along with phosphorous in the reddish-brown travertine. Direct FESEM observation shows the presence of tubular amorphous iron compound in the arsenic concentrated part of the reddish-brown travertine. XANES analysis revealed a presence of As (Ⅴ) and Fe (Ⅲ), suggesting an importance of oxidation process in arsenic accumulation in the reddish-brown travertine.

Keywords: Arsenic, Travertine, Accumulation, Spring 8, XANES

Arsenic and antimony concentrations in river water and effect of iron hydroxides on their environmental mobility: Case study of Ichinokawa mine area

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Abstract

Ichinokawa abandoned mine is one of the famous stibnite mines in Japan. A considerable amount of antimony from the country rock is dissolved to adjacent river water (~ 280 μg/L Sb) by the chemical weathering. Precipitation of iron hydroxides is observed in the streambed at the downward of the Median Tectonic Line (MTL). Arsenic and antimony contents in the river water at the upstream of the appearance of the MTL are > 13 and > 280 μg/L, respectively. On the other hand, the contents of the arsenic and antimony in the downstream water from the MTL change to 39 and 4.5 μg/L, respectively. Arsenic content in the water increases once with appearance of iron hydroxides on the streambed, and decreases gradually to the downstream (39 to 11 μg/L As). Antimony content in the water decreases drastically near MTL (280 to 4.5 μg/L), and increases gradually to the downstream (4.5 to 52 μg/L). The pH value and water temperature decrease once at the MTL (pH = 6.9, T = 16.6°C), and increase again (pH = 7.7, T = 19.5°C) to the downstream. Concentration ratios between iron hydroxides and water (concentration in iron hydroxides / concentration in water) for arsenic and antimony change with the position of the sampling site. Namely, the concentration ratios from up- to downstream samples change from 200,000 to 530,000 for arsenic and from 140,000 to 14,000 for antimony. This suggests that migration behavior of antimony is different from that of arsenic depending on environmental conditions.

Natural purification of antimony contaminated river water around the Ichinokawa abandoned mine may perform effectively but locally by formation of iron hydroxides. In accordance with change of the water condition such as pH and crystal structure of iron hydroxides, antimony absorbed once in the precipitates may liquate out gradually again in the river water.

Keywords: Arsenic, Antimony, Iron hydroxide, Ichinokawa