Oxygen isotope study of silica sinter from the Osorezan geothermal field, northeast Japan

KEN-ICHIRO HAYASHI[1]

[1] Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan (*correspondence: khayashi@geol.tsukuba.ac.jp)

Silica sinter developed on the northern shore of Lake Usoriyama in the Osorezan geothermal field was examined for the occurrence, texture, and crystallinity of silica minerals, and the concentrations of trace elements and oxygen isotopes. The silica sinter of this study consists of two parts, a thick eastern mound (layer A) and a thin western part (layer B). Layer A's maximum thickness is 150 cm, and it consists of alternating white to light gray layers about 1 cm thick interspersed with yellowish and reddish layers. A red to reddish gray layer with a unique stromatolitic texture, having aggregates of stratified concentric layers extending upward, appears in the middle of layer A. Layer B is characterized by alternating loose white layers about 1 mm thick. The mineralogical constituents of the sinter are dominated by silica minerals. Layer B consists of opal-A, while layer A contains opal-A and opal-CT.

We measured trace elements such as Au, Hg, As, and Sb. Au content ranges from 5 to 310 ppb, and Hg content is between 0.8 and 30.1 ppm, with high concentrations observed in the colored layers of layer A. The concentration of As varies between 40 and 201 ppm, and an exceptionally high concentration of As, 650 ppm, was observed in newly formed white silica sinter around an active vent.

The $\delta^{18}O$ of the silica minerals in layer A vary between 13 and 26‰, while those of layer B are higher, from 19 to 33‰. The $\delta^{18}O$ of the water estimated from the $\delta^{18}O$ of the silica sinter is heavier than that of local meteoric water, but approximately overlaps with the $\delta^{18}O$ range observed in present-day hot spring waters. This overlap suggests that the origin of the water from which the 150 cm thick silica sinter of this study is not different from present day hot spring water.