

Characteristics of hot spring water and carbonate deposit from the Obama hot spring in the Unzen Volcanic Area Global Geopark

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Many types of hot springs are located in Unzen Graben of the Shimabara Peninsula, Kyushu, Japan. Their geochemical characteristics are of Cl type (Obama hot spring) in the western side of the Unzen volcano, of SO₄ type (Unzen hot spring) in the Unzen-Jigoku fumarolic area, and of HCO₃ type (Shimabara hot spring) in the eastern side of the volcano.

Carbonate deposit (travertine) is common feature around hot springs. Its morphology, mineralogy and chemical composition provide valuable information about physical and chemical conditions of the carbonate-precipitating waters. In order to identify the formation mechanism of carbonate deposit associated with hot spring, hot spring water and carbonate deposits from the Obama hot spring at Obama Town Historical Museum (one of the geosites in the Unzen Volcanic Area Global Geopark) were investigated.

The mean temperature of hot spring water is 100.1°C and water pH is 7.90. The chemical characteristics of the hot spring water are significantly close to those of sea water. Optical microscopic observation shows that white to yellowish-white carbonate deposits inside of an artificial metallic pipe are completely composed of acicular aragonite crystals. Electron probe microanalysis (EPMA) of the aragonites shows that their chemical compositions are significantly homogeneous throughout the carbonate deposits and no chemical variation has been observed from the outer to the inner part of them. The main component of these samples is CaCO₃, and Sr, Na, Mn, P, Si and S are minor components. The depositional rate of these carbonate deposits are evaluated about 1.2 mm per day. Rapid degassing of CO₂ from high temperature Mg-bearing hot spring water probably enhances metastable nucleation of aragonite crystals.