

Development of in-situ heating measurement methods for dehydration and color change and time scales of volcanic eruptions.

Satoru Nakashima[1]; Satoshi Okumura[2]; Yuta Yamanoi[3]

[1] Interactive Research Center, Tokyo Inst. Technol.; [2] Earth and Planetary Sci, T.I.T; [3] Earth and Planetary Sci., TITech

In order to evaluate time scales of volcanic eruptions, in-situ heating spectroscopic methods has been developed both for dehydration by IR microspectroscopy and for color change by visible microspectroscopy.

Dehydration rates of hydrous rhyolitic glasses at 475 – 875 C were measured by in-situ infrared (IR) spectroscopy and averaged apparent diffusion coefficients D of total water were obtained (Okumura and Nakashima, 2004). In the 1929 eruption of Komagatake volcano, the water contents of the melt were 2.8–3.5 wt% at magma chamber and around 0.7 wt% when the magma was quenched at the earth's surface. Dehydration time of 2.4 wt% water can be estimated using the constant apparent diffusivity D of total water at 950 C (about 10 $\mu\text{m}^2/\text{s}$ at 3.1 wt% and 1 $\mu\text{m}^2/\text{s}$ at 0.7 wt%) and the constant film thickness (around 100 μm). The obtained time periods for dehydration are from about a few tens to thousands seconds. Since the magma dehydrates in the ascent process from the magma chamber to the surface, the dehydration time estimated above can be considered as a minimum time scale of magma ascent (Okumura et al., 2004).

Volcanic deposits often display different colors and these are considered to be related to eruption styles (Moriizumi and Nakashima, 2000), dehydration-oxidation processes in a volcanic vent until the ejection, heating processes after the eruption (Yamanoi et al., 2004) and weathering processes after sedimentation (Yokoyama and Nakashima., 2004). In order to study color changes during the magma ascent-ejection processes, an in-situ heating color measurement method has been developed by using a heating stage on a newly developed visible-Raman microspectrometer. Some glasses and minerals will be studied for their color and visible spectral change upon heating. Rates of these color changes will be used to evaluate time scales of the magma ascent-ejection process associated with oxidation.