Chemical and isotopic composition of the fumarolic gas sampled at Mt Iwoyama, Kirishima volcanic area, Japan

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Introduction
Mt Iwoyama is one of the active volcanoes in Kirishima volcanic area, located on the northern flank of Mt Karakuni. Mt Iwoyama was formed at the eruption in 1768 (Imura and Kobayashi, 2001). According to the observation by Japan Meteorological Agency (JMA), in the early of April 2014, the number of volcanic earthquakes increased. In July 2015, volcanic tremors occurred several times. On 15th Dec 2015, a new discharge of fumarolic gas was noticed on the top of Mt Iwoyama. Those observations indicate the increase of volcanic activity of Mt Iwoyama. In general, the composition of fumarolic gas changes along the progress of volcanic activity. We sampled the newly discharged fumarolic gas on 22th Dec 2015 and report the analytical result with interpretations.
Sampling of fumarolic gas
The position of fumarolic gas was N31deg56min48.3sec, E130deg51min10.5sec. The surrounding area of fumarlic gas was covered with whitish altered rock. The temperature of gas was 97.2C. No fumarolic gas other than the observed one was noticed.
Results and discussions
The concentration of HCl was lower than the analytical detection limit. The SO2/H2S ratio was 0.027, similar to the value in 1994 (Ohba et al., 1997). The H2O-CO2-S ternary composition indicates the CO2 enrichment compared to the gas in 1994. The isotope ratio of H2O (dD) was -91 per mill, lower than -55 and -80 per mill, the values of two fumarolic gases in 1994. A part of water vapor in the observed fumarolic gas seems to be removed by the condensation before the discharge at fumarole, because the isotope ratio was low and the fumarolic gas has appeared at the place with no discharge of fumarolic gas, which means the channel of volcanic gas in crust was cool and it removes the enthalpy of water vapor. The H2O-CO2-S ternary composition and isotopic ratio of H2O can be estimated with the calculated addition of H2O removed by condensation. The estimated composition and ratio were similar to the fumarolic gases in 1994 and 1991 at Mt Iwoyama. The N2-Ar-He ternary composition indicated He enrichment relative to the gases sampled in 1991 and 1994. Kita et al (1993) reported the He enriched endmember in fumarolic gases at some volcanoes in south-east part of Japan such as Mt Unzen-Fugendake. If the He enriched endmember is contained in the sampled fumarolic gas, a magma should be involved with nature different from the degassing magma in 1994. Because the number of sampled fumarolic gas is only one, we need to continue the sampling and analysis to confirm the N2-Ar-He ternary composition.
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Keywords: Active volcano, Volcanic gas, Geochemistry

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