水蒸気噴火の噴出物の磁気岩石学的特徴

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Magnetic petrological characterization of eruptive products from phreatic eruptions

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The 2014 eruption at Ontake volcano reminded us that a phreatic eruption can cause a devastating consequence even though its volume is quite small and there was no newly produced juvenile materials during the eruption. In order to clarify eruption processes and transport and emplacement mechanisms of the 2014 eruptive products from Ontake, we have carried out magnetic petrological analysis. Our results indicated that magnetic minerals in the 2014 eruptive materials are characterized by abundant pyrite and small amount of titanomagnetites, suggesting the materials were derived from a shallow hydrothermal reservoir. Thermomagnetic curves showed rapid increase of the induced magnetization above 380 degrees C, derived from decomposition of pyrite to magnetite. Using this magnetic petrological character, spatio-temporal re-distribution of the 2014 eruptive materials has been revealed.

Phreatic eruption of stratovolcano can occur when heated groundwater stored in a shallow hydrothermal reservoir within the volcanic edifice becomes pressurized and flashes to steam. Pyrite is a common mineral produced during hydrothermal alteration of Fe-bearing minerals. Therefore, pyrite can be used as a marker of a phreatic eruption. In order to examine the general presence of pyrite in materials derived from phreatic eruption, volcanic products from Yakedake volcano were investigated by using magnetic petrological methods and the results were compared with those from Ontake volcano. As a result, Yakedake samples did not show obvious evidence of pyrite. Dominant magnetic minerals were estimated to be titanomagnetites. It is suggested that physical and chemical condition or duration time of hydrothermal system differ between the two volcanoes.