

Two different origins of sulfides in calc-alkaline andesite suites: Sulfide inclusions in phenocrysts of Asama-Maekake volcano

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Arc basalt magmas transport sulfur from the subducted slab in the mantle wedge to the crust, and some part of sulfur is transferred to felsic magmas in the crust. Here we demonstrate petrologic identification of sulfur in mantle-derived basaltic magma and crustal magma erupting from Asama-Maekake volcano, a frontal volcano of the northeast Japan arc.

In magma mixing system of calc-alkaline andesite suites of Asama-Maekake volcano [1], basalt magma has lost a significant part of dissolved sulfur by sulfide precipitation and volatile exsolution before magma mixing and subsequent eruption. Likewise, melt inclusions trapped in olivine, a rare phenocryst of the basalt magma origin, have lost their sulfur to various degrees (1108 eruption: <2, 100ppm S, 1783 eruption: <2, 700ppm S, 2004 eruption: <2, 600ppm S). On the other hand, common phenocrysts (orthopyroxene, clinopyroxene, and plagioclase) have been crystallized from felsic magma and captured low-sulfur felsic melts as melt inclusions.

Throughout these Asama-Maekake eruptions, phenocrysts captured three types of sulfide precipitates.

Type-A) Heterogeneous globules of quenched immiscible sulfide droplet, composed of fine three phases (<1 μ m) such as mono-sulfide solid-solution (mss)-isocubanite-pentlandite, having bulk chemical compositions of their assemblages.

Type-B) Homogeneous nickel-bearing pyrrhotite blebs, often contacting with the globules and surrounding it.

Type-C) Homogeneous nickel-poor pyrrhotite.

In the case of the Asama-Maekake volcano, the Types-A and B sulfides are the basalt magma origin, and are captured in olivine phenocrysts together with basaltic melts as inclusions. However, the type-C sulfide derives from the felsic magma and is trapped by the common phenocrysts. All of these three types of sulfide are spread both in the groundmass and the reaction rim of phenocrysts.

[1] Aramaki & Takahashi (1992) *IAVCEI Commission on Explosive Volcanism*, 1-60.