Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

SCG61-07 Room:102A Time:May 22 15:45-16:00

Significance of Fe-Cu-Ni-sulfide inclusions in plagioclase megacrysts from Japan

Takuya Echigo[1*], Shino Nishimagi[2], Mitsuyoshi Kimata[2], Masahiro Shimizu[2], Shizuo Saito[2], Norimasa Nishida[2], Mihoko Hoshino[3]

[1]Shiga Univ., [2]Univ. of Tsukuba, [3]AIST

Anorthite megacrysts, which are high-calcic plagioclase (An $>$ 90 mol%) phenocrysts larger than 10 mm, are characteristic minerals occurring in basalt - andesite from Japanese Islands arc (Kimata et al. 1995). Anorthite megacrysts from Miyake-jima contains various inclusions such as native cupper (Cu: Murakami et al. 1991), native zinc (Zn: Nishida et al. 1993) and native brass (Zn-Cu arroy: Nishida et al. 1993). In addition, hydrocarbon was also reported from Miyake-jima anorthite (Kimata et al. 1993), which suggests that slab sediments on subducting plates had important role for crystallization of these anorthite megacrysts. These past studies indicate that mineral, melt or liquid inclusions in anorthite megacrysts may afford a clue to the formation process of such minerals.

We report the analytical results of sulfide inclusions in anorthite megacrysts from Ogi peninsula in Sado Island and Mt. Fubou (one peak of Zao mountains). Both megacrysts occur in lavas erupted in the Tertiary period; the former volcano is located along the volcanic front and the latter is along the back-arc in Japan, respectively. The chemical analyzes of the anorthite megacrysts (host crystal) and sulfide inclusions were carried out using an electron microprobe analyzer with wavelength dispersive X-ray spectroscopy (EMPA-WDS: JEOL JXA-8621) and/or a scanning electron microscope with energy dispersive X-ray spectroscopy (SEM-EDS: JEOL JSM-6610LV).

The analytical results show that the anorthite megacrysts from both Ogi and Mt. Fubou contain sulfide inclusions that are droplet-shaped and 30 - 50 micrometer in diameter. The chemical compositions of the sulfide inclusions from both of the localities are heterogeneous; Fe-rich phase and Cu-rich phase were observed within a single inclusion. Quantitative analyzes suggest that the Fe-rich phase is pyrrhotite [$Fe_{(1-x)}S$ (x=0-0.17)] and Cu-rich phase is cubanite ($CuFe_2S_3$), respectively, and these phases contain both Ni and Cu. These sulfide inclusions consisting the two phases may be trapped as fluid inclusions in the host crystals (anorthite megacrysts) at high temperature. The trapped sulfide liquids seem to be separated from silicate melts as monosulfide solid solution ($Fe_{(1-x)}S$-$Ni_{(1-x)}S$: Naldrett et al. 1967) or intermediate solid solution ($CuFeS_2$: Fleet 2006) and exsolved into pyrrhotite and cubanite in the host crystals upon cooling. The present study indicates that sulfide melts rich in Fe, Cu and Ni were generated within magmas along the volcanic front and back-arc in Japan.

Keywords: Plagioclase megacryst, Arc magma, Sulfide, Inclusion