Högbomite from West Ongul Island, Lützow-Holm Complex, East Antarctica

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Högbomite has been found within magnetite megacrysts (5 cm × 3 cm) from the upper amphibolite- to granulite-facies pegmatite cutting the medium-grained quartzo-feldspathic garnet-biotite gneiss at West Ongul Island, Lützow-Holm Complex, East Antarctica. Associated minerals included in magnetite are biotite, plagioclase, hercynite, sillimanite, corundum, quartz, rutile, ilmenite, hematite, and zircon. Högbomite occurs as very fine euhedral to subhedral crystal (5-20 µm) along grain boundaries between magnetite and ilmenite or less commonly enclosed in hercynite (Fig. 1) and in magnetite. Quartz is found in hercynite. Högbomite is in direct contact with hercynite. Ilmenite contains hematite exsolution lamellae. Hematite also forms exsolution lamellae in rutile, which is trapped in ilmenite. Corundum is in direct con-tact with magnetite, hercynite or sillimanite. Electron microprobe analyses of högbomite yield 2.6-7.9 wt% TiO_2, 60-64 wt% Al_2O_3, 0-0.1 wt% Cr_2O_3, 18-25 wt% Fe (as FeO), 0.3-0.6 wt% MnO, 2.9-4.4 wt% MgO, 4.8-10 wt% ZnO, 0.61-0.01 wt% SnO_2, and 0.20-0.36 X_{Mg}. Hercynite varies 4.9-14 wt% ZnO and 0.23-0.36 X_{Mg}. Sillimanite contains 0.6-3.6 wt% Fe_2O_3 from rim to core and < 0.1 wt% TiO_2. Textures and mineral chemistry suggest that the reaction, Mag + Ilm + H_2O + O_2 → Hög + Hc + Qtz, took place at retrograde stage ($T <$ 600 °C) whereby magnetite and ilmenite contained impurities Si, Al, Zn and Mg. Hydrous and oxidized fluid, possibly supplied by crystallization process of pegmatite, were sufficiently enough to form högbomite and biotite. Subsequent cooling processes hematite crystallized as exsolution lamellae from ilmenite and rutile, and sillimanite and corundum became Fe_2O_3-poor at the rim.

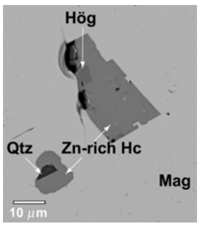

Figure 1: Backscattered image of högmatite + hercynite and her-cynite + quartz in magnetite.

Neogene Central Andean adakites, frontal arc migration and forearc subduction erosion at 27°-28.5°S

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Glassy plagioclase phenocryst-free 8 to 2 Ma Andean andesitic lavas erupted at 27°-28.5°S can be argued to contain continental crust incorporated in the sub-arc mantle by forearc erosion as well as by melting in the overlaying ~65-70 km thick crust. These distinctive ~7.7 Ma pyx-bearing Dos Hermanos and 7-2 Ma amp-bearing Pircas Negras lavas (54-64% SiO_2) erupted as the frontal arc was being displaced ~50 km eastward over a developing bend in the Wadati-Benioff zone that now marks the Chilean flat-slab northern margin [1]. These lavas can show the most HFSE depletion (La/Ta=40-100) and adakitic-like character (Sm/Yb=4-9; Sr=600-1400 ppm) among Neogene lavas in the region and have higher $^{87}Sr/^{86}Sr$ (0.7055-0.7065) than 26-13 Ma lavas (<0.7055). Some 5-3 Ma lavas have high Mg# (to 61), Cr (to 250 ppm) and Ni (to 65 ppm). Their chemistry fits with trace element and isotopic models [2, 3] that begin with > 2 GPa partial melts of ~85:15 mixtures of mafic Jurassic and silicic Paleozoic Chilean forearc rocks reacting with sub-arc mantle peridotite. Mineral thermometry and MELTS program models for the Pircas Negras lavas indicate pre-eruption temperatures near 1050°C showing these magmas can then mix with and melt the overlying eclogitic crust. Given a constant arc-trench gap over the last 8 Ma, ~124 km^3/m. y./km of forearc crust needs to be removed to account for frontal arc migration at 8 to 2 Ma and is readily available to contaminate the mantle wedge.

[1] Mulcahy & 7 others (2010) *AGU* **91**, T11A-2050. [2] Goss & Kay (2009) *EPSL* **270**, 97–109. [3] Goss (2007) PhD thesis, Cornell Univ. Ithaca, NY, 351 pp.