Lower crustal pyroxenites in lithospheric mantle of NW Spitsbergen, Svalbard Archipelago

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Grt-Spl-pyroxenite xenoliths from Quaternary volcanoes of NW Spitsbergen, Svalbard Archipelago, equilibrated at mantle depths (990-1100 ^{o}C, 1.6-2.0 GPa) but partially preserved primary magmatic hypidiomorphic texture and Spl-Opx-Cpx association. Pyroxenes are high-aluminous; spinels are $(Mg,Fe)Al_2O_4$ solid solutions with low Cr content. Bulk rock composition is consistent with the derivation of these rocks as Pl-free, Spl-Opx-Cpx ±Grt, Amph cumulates from hydrous basaltic melts at 1 GPa ≤P< 2GPa. However, Na content in Cpx is higher than in experiments at 1.2-1.3 GPa [1, 2], whereas, at P=2 GPa, Opx and Spl are not present on the liquidus [3]. Garnet replaces spinel or forms xenomorphic to polygonal grains as rock texture changes from hypidiomorphic to granoblastic. Cpx becomes less aluminous at similar Na content in granoblastic rocks. This points to that the rocks were metamorphosed with the formation of garnet and the change of pyroxenes compositions. Initial cumulates could have crystallized from evolved basaltic melts because pyroxenes and spinels are Cr-poor and have mg# 0.75-0.80 and 0.54-0.57 respectively. We suggest that the crystallization occurred at depths greater than 30 km, beneath or within the lower crust of a mature island arc or an active continental margin but pyroxenite bodies should have subsided later into lithospheric mantle.

[1] Müntener et al. (2001) *Contrib. Mineral. Petrol.* **141**, 643-658; [2] Melekhova et al. (2015) *J. Petrology* **56**, 161-192; [3] Pertermann & Hirshmann (2003) *J. Petrology* **44**, 2173-2201.