



## **Petrological and geochemical studies of mantle xenoliths from La Palma, Canary Islands**

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La Palma is the second youngest island, after El Hierro, of the Canary archipelago. The archipelago consists of seven large islands, forming an east-west-trending island chain, and several seamounts. All together they form a volcanic belt of around 800 km length and 450 km width, which presumably comprises roughly the Canary hotspot. The islands are located off the western coast of Morocco, Africa. The distance ranges from 100 km to 500 km. Concurrently with the distance, subaerial volcanism age progresses from the oldest lava in the east to the youngest in the west of the archipelago. Presently, La Palma is in the shield building stage of growth (alongside with El Hierro and Tenerife) and is furthermore the fastest growing island of the Canary archipelago. Historical volcanic eruptions are restricted on the younger islands, La Palma and El Hierro, with the last eruption at the south end of La Palma in 1971.

Mantle xenoliths described in this work were collected at the slopes of San Antonio Volcano, Fuencaliente, brought to the surface during the 1677/1678 eruption. The mantle xenolith collection comprises sp-lherzolites, sp-harzburgites and pyroxenites. The texture can be distinguished between coarse-grained matrix and fine-grained veins in various thicknesses, mostly with olivine and pyroxene but also with amphibole, phlogopite as well as apatite.

Mineral analyses reveal the existence of primary and secondary ol, cpx and opx. Primary ol has Fo contents of 89.2 to 91.7 and NiO ranging from 0.3 to 0.45 wt.%, whereas secondary ol show Fo values of 78.4 to 91.9 but with NiO below 0.3 wt.%. Primary cpx are predominantly Cr-Diopsides with En<sub>48.7-51.9</sub>-Wo<sub>43.5-44.3</sub>-Fs<sub>4.1-4.9</sub> and Mg# of 91.5 to 92.4. Secondary cpx, primarily Ti-Augit, display En<sub>36.7-44.4</sub>-Wo<sub>47.7-49.6</sub>-Fs<sub>6.7-13.0</sub> and Mg# of 75.3 to 90.8. Primary opx compositions are in range of En<sub>89.3-90.6</sub>-Wo<sub>1.3-1.5</sub>-Fs<sub>8.1-9.3</sub> with Mg# between 90.7 and 92.0. Secondary opx exhibit En<sub>88.7-89.2</sub>-Wo<sub>1.7-1.9</sub>-Fs<sub>9.1-9.5</sub> and Mg# of 90.7 to 91.6. Cr# in sp extends from 50.4 to 87.9 suggesting that all pre-existing sp has been influenced by melt percolation.

A striking feature of these rocks is the presence of intergranular glasses as an effect of melt percolation. The composition of the glasses is phonolitic, trachytic and basanitic. Such compositions correspond to the rock types found in the south of La Palma along the Cumbre Vieja ridge indicating that the xenoliths besides the modal metasomatism have experienced host basalt infiltration. The peculiarity of one sample is h a yne, localized within veins in association with amphibole, olivine and clinopyroxene. Evidently in this sample, the host-basalt infiltrated the mantle xenolith for h a yne is commonly part of basaltic lava.

Equilibration temperatures calculated using two-pyroxene-thermometer of Brey and Koehler (1990) are estimated to be in the wide range of 726 to 1105°C at 1.5 GPa pressure, indicating that the studied xenoliths sample various depths of the oceanic lithosphere underneath the Canary Islands.

### References

BREY, G.P. & KOEHLER, T. (1990). Geothermobarometry in four-phase lherzolites II. New thermobarometers, and practical assessment of existing thermobarometers. *Journal of Petrology* 31, 1353–1378.