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Amphibole from peridotite xenoliths, Wołek Hill, north-eastern part of Central European Volcanic Province (SW Poland)

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The north-eastern part of the Cenozoic Central European Volcanic Province is located in SW Poland. Some of the lavas contain mantle peridotite xenoliths, which typically contain no hydrous minerals suggesting volatile-bearing modal metasomatism. One of the few exceptions are amphibole-bearing xenoliths occurring in basanites at the Wołek Hill in the Kaczawskie Mts. Xenoliths from Wołek Hill are from few to ca. 20 cm. Most of them are spinel harzburgites, only few of smaller size (3-6 cm) contain amphibole, which content is < 5 vol. %. The latter have the composition of dunite or wehrlite.

Two xenoliths contain amphiboles occurring as: (1) tabular crystals 0.4-0.7 mm in diameter, surrounded by glass pockets with subordinate spinel. Ilmenite and carbonates occur in some of those pockets; (2) < 1 cm amphibole-clinopyroxene clusters, containing amphibole grains 0.1-2 mm in diameter. The xenoliths contain no orthopyroxene. The olivine is Fo 85.5 (xenolith A) or Fo 89.0 (xenolith B), clinopyroxene is characterized by #mg = 87-89, Ca 0.81, Al 0.22 a pfu in both xenoliths. The primary spinel is ca. #cr = 40. Tabular amphibole grains have the composition of pargasite (#mg = 84-87, Al = 2.24, Ti = 0.30, Na = 0.78-0.84 atoms pfu, total Fe as Fe2+); at the contact with glass thin (ca. 10 μm), locally euhedral and spongy rims of kaersutite composition occur (#mg = 67, Al = 2.55, Ti = 0.84, Na = 0.67 a pfu). Amphibole in the amphibole-clinopyroxene clusters is pargasitic (#mg = 83-87, Al = 2.21, Ti = 0.30, Na = 0.78-0.84 a pfu) and also have thin (ca. 15 μm) rims of kaersutite (#mg = 80, Al = 2.41 a pfu, Ti = 0.77 a pfu, Na = 0.75 a pfu).

Two another xenoliths contain 10-30 μm amphibole intergrowths in orthopyroxene. The amphibole has the composition of pargasite to edenite (#mg = 90, Al = 2.00, Ti < 0.07, Na = 0.98 a pfu). The olivine occurring in these xenoliths is Fo 90, orthopyroxene #mg = 91, Al = 0.02-0.09 pfu, clinopyroxene has #mg = 91,Ca = 0.75-0.79, Al = 0.20 a pfu and is slightly enriched in Cr (0.06-0.08 a pfu).

Homogeneous pargasitic (#mg = 74, Al = 2.50, Ti = 0.30, Na = 0.67 a pfu) amphibole megacrysts ranging from 3 to 6 cm occur also in the Wołek basanites. The megacrysts contain intergrowths of olivine + clinopyroxene + rhönite + carbonate.

The amphiboles occurring in the xenoliths from Wołek basanite are texturally later than the main phases forming the xenoliths and in some xenoliths are associated with clinopyroxene. They are modified by late glass related to pre-eruptive or eruptive infiltration of silicate melt. Thus, the amphibole probably originated under mantle conditions due to hydrous metasomatism preceding pre-eruptive melt infiltration. The amphibole megacrysts supposedly originated under different conditions.