

## Modal metasomatism in upper mantle from Eastern part of Central European Volcanic Province (SW Poland).

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Cenozoic volcanic rocks of mafic affinity occur abundantly in central Europe forming the Central European Volcanic Province. The ascending magmas intensively sampled upper mantle peridotites. Mantle xenoliths from the Eastern part of CEVP (SW Poland) are in general strongly depleted and nominally anhydrous.

Small amounts of hydrous phases (mostly pargasitic amphibole) in xenoliths from Lutynia and Wilcza Góra were reported in literature (Blusztajn and Shimizu, 1994, Chem.Geol; Matusiak-Małek *et al.*, 2010, Lithos). The first locality with significantly higher amounts of amphibole was described by Nowak *et al.* (e.g. 2010, EGU2010-9299) from Wotek Hill.

Mafic and ultramafic xenoliths from Wilcza Góra basanite form four compositional groups. Almost half of the xenoliths contain pargasitic amphibole with modal compositions up to 5%. Amphibole forms: (1) intergranular grains; (2) amphibole-spinel-clinopyroxene clusters in host peridotite; (3) cores of clinopyroxene II; (3) lamellae in pyroxenes and (4) amphibole-olivine vein. Composition of amphibole follows compositional variations of host peridotite. The mg-number in amphibole occurring in peridotitic xenoliths is 0.910, the TiO<sub>2</sub> content is 0.262-0.413 wt.%. Amphiboles in xenoliths affected by "Fe-metasomatism" have mg-number from 0.892 to 0.852, while in cumulative xenoliths the latter is 0.854-0.734. The TiO<sub>2</sub> content is 0.533-2.220 and 2.915-3.508 wt.%, respectively. One xenolith contains vein formed of high mg-number 0.860-0.908 and TiO<sub>2</sub>-rich (3.253-3.705 wt.%) amphibole. The REE pattern of the vein amphibole is LREE-enriched with negative inflection from Nd to La. It perfectly mimics REE composition of coexisting clinopyroxene.

Amphibole in Wilcza Góra xenoliths stands for local modal metasomatism in upper mantle beneath SW Poland. Composition of the amphibole suggest that it was introduced to the host peridotite together with clinopyroxene I due to reaction with hydrous mafic alkaline melt(s).

## Oxidation state of iron in a primary Martian basaltic melt

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Olivine is an extremely important mineral in the generation and evolution of basaltic melts. Roeder and Emslie [1] concluded that the olivine (ol) silicate liquid (liq), exchange coefficient,  $K_{D,Fe^{2+}-Mg} = (FeO/MgO)^{ol}/(FeO/MgO)^{liq}$  (by weight), is  $0.30 \pm 0.03$ , independent of temperature ( $T$ ) and liquid composition. An accurate  $K_{D,Fe^{2+}-Mg}$  is predicated on a precise measurement, or calculation, of the abundances of Fe<sup>2+</sup> and Fe<sup>3+</sup> (expressed as Fe<sup>3+</sup>/ΣFe) in the liquid. It is well known that major-element composition can affect Fe<sup>3+</sup>/ΣFe [e.g., 2], and very few measurements have been made on primitive liquid compositions relevant to Martian petrogenesis. We measured the Fe<sup>3+</sup>/ΣFe ratios of a series of experimentally-produced glasses to better constrain the appropriate  $K_{D,Fe^{2+}-Mg}(s)$  to use for Martian systems.

One-atmosphere, super-liquidus (1450°C) experiments were performed on a synthetic basalt modeled after the primitive magmas found near Home Plate (50% SiO<sub>2</sub>; 10% Al<sub>2</sub>O<sub>3</sub>; 18% FeO\*; 12% MgO) [3] at log $fO_2$ s ranging from -10 to -0.68. Fe<sup>3+</sup>/ΣFe of the resulting glasses were measured using Mossbauer and XANES spectroscopy. Fe<sup>3+</sup>/ΣFe vary from 0.06 to 0.68, and compare favorably with estimates based on terrestrially-relevant experiments [4]. Our results appear to contrast with much lower Fe<sup>3+</sup>/ΣFe reported for similar experiments on a Zagami bulk composition [5].

One-atm experiments on model Martian compositions provide the tightest constraint on  $K_{D,Fe^{2+}-Mg}$  because  $T$  and  $fO_2$  are well known, allowing us to use [4] to predict the amount of Fe<sup>2+</sup> present in each liquid. The median of 17 published 1-atm experiments yields  $K_{D,Fe^{2+}-Mg} = 0.354 \pm 0.008$  (error is one mean absolute deviation). Applying this  $K_{D,Fe^{2+}-Mg}$  to the ol-phyric shergottites, leads to the possibility that Y980459, NWA 5789 and 2990 are liquid compositions (others appear to have accumulated olivine), identical to the results of [3].

[1] Roeder & Emslie (1970) *CMP* **29**, 275-289. [2] Sack *et al.* (1980) *CMP* **75**, 369-376. [3] Filiberto & Dasgupta (2011) *EPSL* **304**, 527-537. [4] Jayasuriya *et al.* (2004) *Am. Miner.* **89** 1597-1609. [5] Righter *et al.* (2013) *Am. Miner.* **98** 616-628.