



Grain-scale processes of melting and metasomatism inferred from reaction textures in lherzolite xenoliths.

Christiane Wagner and Marie-Lola Pascal

Lab. "Magmas, Minéraux, Matériaux", UPMC Univ. Paris 06, CNRS-UMR 7193, iSTeP, F-75005, Paris, France
(christiane.wagner_raffin@upmc.fr)

Mantle-derived xenoliths commonly show reaction textures, mostly reaction rims on orthopyroxene, glass-bearing sieve-textured clinopyroxene and spinel, and glassy pockets around spinel and amphibole. The origin of these textures remains controversial, either in relation to various processes that occur in the upper mantle, melting [1, 2]) and metasomatism [3, 4], or during the xenoliths transport to the surface [5, 6]. As the textural modifications of whatever origin may be very similar, the crucial point for assessing mantle processes - particularly mantle metasomatism- is thus to identify the mantle-originated textures and to discard any possible imprint of xenolith-host magma interactions.

This contribution is part of a study of reaction textures in a suite of anhydrous and hydrous (with amphibole and minor mica) spinel lherzolites from the French Massif Central, which have been modally and/or cryptically metasomatized in the mantle and show evidence of progressive metasomatism imprint along percolation paths [7]. Reaction textures are mainly of two types: i) Type 1, the most common type observed both in anhydrous and hydrous samples, consists of reaction zones around spinel (\pm amphibole) with secondary clinopyroxene, olivine, spinel, \pm plagioclase, formerly volatile-filled bubbles, and small (10 μ m) patches of fresh colourless glass. Spinel may have a sieve-textured rim. ii) Type 2 corresponds to spongy clinopyroxene and is only observed in a few samples together with spinel reaction zones. Fresh glass also occurs as thin veinlets along grain boundaries and as fracture filling in primary olivine and pyroxene. This contribution mainly focuses on Type 1 and presents detailed major and trace element compositions of primary and secondary minerals and glasses, and fO_2 estimations, with emphasis on the equilibrium / disequilibrium conditions of the assemblages using element partitioning and thermodynamic modelling.

An important point is that no relation can be evidenced between the development of the reaction zones and the distance of the xenolith-host magma contact. The composition of the secondary phases differs from that of the primary phases and the glass composition, which falls in the world-wide range of mantle xenolith glasses, varies between the different xenoliths or within one single xenolith. In the hydrous samples the amphibole breakdown exerts a major control on the glass composition but cannot account for the alkali budget, although a mass balance approach may be questionable [6]. As host magma infiltration can be discarded and no fractional crystallization of secondary phases can explain the alkali content of the glasses, an additional component is required. The percolation of the infiltrating melt may have triggered the amphibole melting. Its nature can be inferred from the glass composition, however, discriminating element plots [3] gives contradictory (alkali and carbonatitic geochemical signature) informations when considering major or trace elements on the same reaction zones. In the anhydrous samples, the glass composition also appears to require a source that contains amphibole. The different points will thus be addressed and discussed taking into account recent experimental studies [8, 9].

[1] Franz and Wirth, 1997, *Contrib. Mineral. Petrol.*, 129, 268-283; [2] Carpenter et al., 2002, *Mineral. Petrol.*, 74, 149-162; [3] Coltorti et al., 2000, *EPSL*, 183, 303-320; [4] Bonadiman et al., 2005, *J. Petrol.*, 46, 2465-2493; [5] Yaxley et al, 1997, *EPSL*, 148, 433-446; [6] Shaw et al., 2006, *Contrib. Mineral. Petrol.*, 151, 681-697; [7] Wagner and Deloule, 2007, *Geochim. Cosmochim. Acta*, 71, 4279-4296; [8] Shaw and Dingwell, 2008, *Contrib. Mineral. Petrol.*, 155, 199-214; [9] Lo Cascio et al., 2008, *Contrib. Mineral. Petrol.*, 156, 87-102.