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Mantle metasomatism vs host magma interaction: the ongoing controversy

C. Bonadiman, M. Coltorti, L. Beccaluva and F. Siena.

Department of Earth Sciences, University of Ferrara. 44100 Ferrara, Italy (bdc@unife.it)

Mantle-derived xenoliths brought to the surface by intraplate magmatism, are an essential source of information about the nature and evolution of the mantle. These xenoliths, being transported very rapidly, are subject to little or no alteration of their primary mineralogy. Since the Seventies they have been considered as valuable material in the study of the processes affecting the mantle, particularly mantle metasomatism. However, based only on major element compositions of the xenolith phases, Shaw and co-authors (2002, 2006) contrast the efficacy of this approach. They present petrological "evidence" that xenoliths may reside in crustal magma chambers for significant periods prior to the eruption and conclude that most of the metasomatic textures, which include alkali-silicate glasses, are erroneously interpreted as effects of mantle metasomatism, while they actually represent textures imposed on the xenoliths during magma transport and/or residence.

The most common feature of worldwide metasomatised mantle-derived xenoliths is the occurrence of spongy textures, frequently associated with glassy patches. Various explanations on their possible origin have been proposed on the basis of heterogeneous geochemical data set. They include: i) fluid-induced melting at mantle depths (i.e. Ionov et al., 1995), ii) reactions induced by the influx of exotic melts into the lithospheric mantle (i.e. Coltorti et al., 1999, Bonadiman et al., 2005; Ionov et al., 2005), and iii) interaction with host magma during the transport (i.e. Shaw & Klügel, 2002, Shaw et al., 2006).

The goal of this contribution is to reinforce the worth of studying mantle metasomatism analyzing mantle xenoliths, taking into account that the interaction between host

lavas and mantle xenoliths exists and sometimes masquerades the processes occurring at mantle depth. To pursue this aim, it is important to find geochemical criteria to discriminate the two processes in relation to the mode of formation of the most common metasomatic textures. In order to carry out modeling for geochemical discriminants, we use a selected group of mantle xenoliths from several localities, with particular emphasis on Cape Verde Islands, which clearly show textural (and geochemical) features which Shaw and co-authors refer as controversy in representing modifications of the xenolith at mantle depth. We propose an approach which includes not only inter- and intra-major element compositions of minerals, but, most relevant, trace element and isotopic compositions in primary and "metasomatic" minerals and glasses, which provide a robust geochemical tool to efficiently investigate the mantle metasomatism behind the curtain of the host lava interaction.

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