Metasomatism in intraplate and suprasubduction lithospheric mantle

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A comparison between petrographic and geochemical features of minerals and glasses from mantle xenoliths hosted in intraplate alkaline and orogenic calc-alkaline s.l. basalts are presented.

Clinopyroxene and amphibole are the main repositories for incompatible trace elements in the mantle, thus providing invaluable clues on the nature of the metasomatizing agents affecting the lithospheric mantle. Their use is however limited by their presence and by their crystallographic constrains. In this respect, glasses produced by reactions with metasomatic fluids represent a very useful tool, but they are less commonly found, especially in suprasubduction environments.

The nature of the metasomatizing agents in intraplate settings are by far much better understood than their orogenic counterpart. Several diagrams using minerals and glasses were put forward aiming at defining the nature of the metasomatizing agents, i.e. Na-alkaline silicate, K-alkaline silicate or carbonatite in intraplate settings.

Fewer data are however available on the geochemical features of the metasomatic phases in suprasubduction settings, and, by consequence, on the nature of the metasomatizing agents involved. This can vary from volatile-bearing fluids to pure melts, which, in its turn, may involve oceanic crust plus variable amount of sediments, resulting in an extremely complex range of fluid compositions, percolating upward and reacting with the overlying mantle wedge. Few cases where a “clear” subduction signature can be recognized in cpx and amph are presented and their geochemical characteristics compared with those from intraplate metasomatism. In these cases intraplate metasomatism is overprinted on the previous subduction enrichment. This fact bear some analogies with the magmatic events which can be observed on the surface, where intraplate alkaline magmatism follows, in a time span of about 10-15Ma, the calc-alkaline s.l. magmatism. Amphibole represents the best tool for investigating the different metasomatic styles and may also be used for recording the transition between the two different events. The role that accessory phase, such as rutile, is playing during melting or dehydratation of the slab and the recycling of this phase into the mantle as possible Nb- and Ti-rich reservoirs are addressed. If this is the case the physical and chemical relationships between subducted slab and intraplate magma generations can be also tentatively put forward.