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GLASSES IN MANTLE XENOLITHS: A TOOL FOR UNDERSTANDING MANTLE PROCESSES

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ABSTRACT

A new perspective in the evolution of mantle material was developed along with the concept of metasomatism, that is peridotitic mantle could not only be depleted through melting process, but it could also get enriched by migration and reaction with fluids coming from deeper mantle portions.

Anydrous mantle parageneses alone are not able to generate the wide magma spectrum which characterise, for example, alkaline intraplate magmatism and the presence of hydrous minerals, such as amphibole and phlogopite, has to be invoked.

However, not every magmatic event occurring in the astenospheric or even lithospheric mantle reach the surface and, hence, may be detected. Most very-low degree partial melts, such as lamproites, lamprophyres or carbonatites, rarely, if ever, reach the surface, but, nevertheless, they may deeply modify the overlying mantle portions.

In this context mantle glasses represent a powerful tool for investigating these basic petrogenetic problems. Their study may contribute to highlight a) which are the relationships between glasses, metasomatic processes and the formation of amphibole, phlogopite and other metasomatic phases, and b) which might be the relationships between glasses, geochemical components and basaltic magma production.

In the following petrographical and geochemical (major and trace elements) features of three well-studied glass populations from oceanic and continental lithospheric mantle are reported. They were found within mantle xenoliths, in intra-plate magmatic settings, from Grande Comore island (Indian Ocean), Sal island (Cape Verde, Atlantic Ocean), and Veneto Volcanic Province (Southern Alps, Italy). Afterward, their characteristics will be compared with those of mantle glasses reported world wide. All studied xenoliths bear spinel as the only aluminiferous phase, then investigation is confined in the spinel stability field.

The three groups of mantle xenoliths present quite distinctive geochemical features (both for major and trace element contents), such as Na_2O/K_2O ratio, and SiO_2, CaO, TiO_2, Zr, Sr, Rb and Ba contents, which allow to put some constrain on the nature of the original metasomatic agents.

The final goals will be to identify i) what do glasses represent and which is the process controlling their formation, ii) what are the metasomatic fluids which might be responsible for their genesis and iii) what are geochemical markers which may be suitable for discriminating between Na- or K-rich alkali-silicate vs carbonatite metasomatism.