Multistage mantle metasomatism beneath the Sangilen Highland

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Migration of minerals through the subcontinental lithospheric mantle is one of the key processes during the evolution of its mantle xenoliths. Late Ordovician lamprophyric dykes of the Amsagul-Elshin mantle province of the West-Sierra Leone carried up numerous large and unaltered xenoliths of mantle pyroxenite, peridotite [1, 2] with several composite xenolitits, veins of volatile-bearing minerals in spinel peridotite. Here we report the results of detailed mineralogical investigations of four samples of contact xenoliths.

The studied samples are represented by CPx-Plg-Mg, Amph-Plg-Mg, and Amph veins cutting pyroxene xenoliths of the spinel facies. Detailed study of the mantle xenoliths shows significant differences in the distribution of major and trace elements at the contact with different compositions. Peridotites at the contact with Plg-bearing veins are modified in composition and characterized by profiles of metasomatic alterations [3]; pyroxene minerals are characterized by trends with enrichment in Fe, Ca, Al, Ti, and MgO in the range -2500 to 1500 ppm. All samples contain amphibole and plagioclase.

Detailed petrological and geochemical studies of composite xenoliths revealed the presence of at least two stages of metasomatic enrichment of the lithospheric mantle beneath the West-Sierra Leone. The first step was related to the formation of the Plg-bearing veins. The formation of these veins is associated with the subduction of the oceanic crust and the formation of composite xenoliths containing a high proportion of olivine. The second stage of metasomatic enrichment is related to the formation of the amphibole veins, which crystallized from a melt with high silica content and low silica content, respectively.

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A structural study of Cr-spinelites from mantle xenoliths of Cameroon, Libya and Morocco

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Cr-spinelites of mantle xenoliths from Cameroon (CAM), Libya (LIB) and Morocco (MOR) have been analyzed by X-ray single-crystal diffraction.

The data of LIB show the largest variability spanning between 1.121 (1) and 1.265 (2) Å, while for MOR, samples, they are in the range 1.134 (1) - 1.202 (2) Å, and for CAM they vary between 1.161 (1) - 1.151 (2). For MOR and CAM, the oxygen positional parameter is very similar ranging between 0.2625 (1) and 0.2625 (2). The MOR samples show a more distinct MgO content than the CAM samples, with a narrower range of values.

In LIB, the cation of Mg is usually below 0.15%, in CAM and MOR, it is usually above 0.15%. MgO below 0.15% in LIB, CAM and MOR

In CAM and LIB, Cr is usually above 0.15%.

In CAM samples, TiO2 is usually below 0.15%.

In CAM, the CaO content is usually above 0.15%.

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