AMPHIBOLES IN MANTLE XENOLITHS FROM ANOROGENIC AND OROGENIC SETTINGS. EVIDENCE BEARINGS ON DIFFERENT STYLE OF METASOMATISM AND IMPLICATION FOR NB AND TI ANOMALIES IN CALK-ALKALINE MAGMAS

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Abstract

Major and trace element distribution in amphiboles from intraplate and subduction-related mantle xenoliths are compared with the aim of identifying two different geochemical signatures and, consequently, two different metasomatic styles. Only mantle xenoliths brought to the surface by magmas with calk-alkaline (s.l.) affinities are included in the "orogenic" group. In order to avoid misleading interpretation, xenoliths hosted in alkaline magmas which may record or may have inherited an orogenic signature and xenoliths from K-alkaline intraplate settings are not considered. Due to the scarcity of data in the orogenic group the well-known alpine peridotite of Finero is also included, as an example of subduction-related lithospheric mantle.
In the "anorogenic" group both disseminated and vein amphiboles are present, with a rather different incompatible element distribution, particularly regarding Zr and Ti. Irrespective of the processes responsible for the genesis of the two amphiboles, both elements, in fact, tend to be enriched in the vein amphiboles. In order to compare similar partial melting degrees, only amphiboles with mg# ranging from 85 to 90 are included in the study.
All intraplate amphiboles (I-Amph) are related to Na-metasomatism (irrespective of the metasomatic agents), thus, as might be expected, they have higher Na2O content than orogenic amphiboles (O-Amph). I-Amph, however, present also the higher K2O contents. As far as trace elements are concerned O-Amph are clearly distinguished from I-Amph by their lower Nb and, to a lesser extent, lower Ti contents, while are almost indistinguishable with respect to Zr contents. In chondrite-normalized REE diagrams, O-Amph have flat to depleted patterns and low SREE content. On the other hand I-Amph always present enriched patterns and higher SREE content.
These data have important implications on the nature of metasomatic fluids migrating through intraplate or supra-subduction mantle and, consequently, on the role played by amphibole in the production of supra-subduction magmas. In this framework, it is difficult to ascribe the Ti, Nb (and Zr) negative anomalies, as well as LREE-enrichment, to the presence of amphibole in the mantle wedge above a subduction zone. An alternative explanation could be a residual phase/s selectively holding back Ti and Nb in the down-going slab.