Geochemical characteristics of Qz-bearing felsic vein in lherzolite xenolith from the Tallante, Southern Spain

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Shimizu, Arai and Gervilla (in this volume) reported petrography and phase compositions of the Qz-bearing felsic vein in lherozlite xenolith from the Tallante, southern Spain. They speculated that the vein has formed from a subduction-related magma, probably caused by a slab-melting and that the melt was evolved by reactions with surrounding peridotite and by mineral fractionations during its upwelling within the mantle. To examine this, we determined major- and trace-element compositions of the vein.

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We have carefully obtained 4 g of powder sample of the vein. Major- and trace-element compositions were determined by XRF and LA-ICP-MS, respectively, at the Australian National University. The powder has 19.5 wt. % of MgO and 4 wt. % of FeO, indicating that it still contains considerable amount of ultramafic components. Model bulk chemical compositions for the vein are, therefore, calculated by subtraction of a lherzolite composition (Ancochea & Nixon, 1987). The amounts of the peridotite composition contaminated by the felsic melt are estimated in a way such that calculated compositions have to 1, 3, 5 wt. % of MgO content to be more than 40 wt. %. The model bulk compositions of the vein are > 65 wt. % for SiO2, < 0.1 wt. % for TiO2, > 13 wt. % for Al2O3, < 1.5 wt. % for FeO, > 14 wt. % for CaO, < 1.5 wt. % for Na2O wt. % and < 0.2 wt. % for K2O. The major-element composition of the vein does not directly represent magma composition because of its high CaO content and low-alkali and TiO2 contents relative to subducted-related high-Si magmas, such as adakite and TTG. Primitive-mantle normalized pattern (PM pattern) of the powder for trace elements is characterized by strongly fractionated REE, week negative anomalies of high-field strength elements (HFSE: Ti, Nb, Zr and Hf), Eu, Sr, Rb and Ba, and enrichment of Th and U. Because of low trace-element abundance in peridotite relative to the vein, the PM pattern of the model composition is just slightly shifted to upward. Trace-element PM pattern is roughly similar to that of subduction-related magmas. In particular, fractionation of the HFSE relative to other trace elements are usually found in igneous rocks from the convergent plate margin and in the average continental crust, and is generally interpreted to be a process occurring during subduction. Thus geochemical characteristics combined with pre-existence of the calc-alkaline magmatism in the studied area suggest that origin of the Qz-bearing felsic vein was related to subduction-related magmas, probably caused by slab-melting. There are, however, some considerable differences in geochemistry between the vein and subduction-related magmas. These differences can be explained by reaction and assimilation with surrounding peridotite, and by mineral fractionations from the melt during the melt passage through the mantle. We believed that the Qz-bearing felsic vein has formed from an evolved slab-melt modified by assimilation/fractional crystallization within mantle wedge.