Melts in a single lava flow from a multiply subduction-modified mantle column below Central Italy

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Latera stratovolcano, situated in the northernmost part of the Roman Magmatic Province (Central Italy), represents a late activity stage of Quaternary volcanism in the Vulsini complex. Lava compositions range between leucite-bearing ultrapotassic (HKS) and shoshonitic (SHO). We determined major-element, trace-element and Pb-isotope compositions of homogenized melt inclusions (MI) trapped in Fo-rich olivines (Fo_{91}-Fo_{87}) that were separated from samples of a voluminous lava flow with SHO affinity (Selva Del Lamone flow, SDL) and a HKS lava. Two populations of magmatic olivine, MI and spinel have been distinguished in the SDL lava, based on morphologies and compositions of host olivines and inclusions. A wide range in CaO contents of Fo-rich olivine points to crystallization from compositionally different primary melts. We infer that the SHO lava comprises two distinct mantle-derived alkali-rich melts: (1) "normal" SHO type, compositionally closest to the host rock; and (2) "low-CaO" high-Na_2O melt with lamproitic affinity. The MI from the SDL lava show an extreme Pb-isotopic diversity: $^{206}/^{204}$Pb = 18-19.2, $^{207}/^{204}$Pb = 14.6-16, $^{208}/^{204}$Pb = 36.5-40.5, each group being characterized by its own signature. The composition of the host lava appears to be a mixture of (at least) three isotopically distinct end-members. The MI form arrays between MORB-source-like mantle and various crustal/sedimentary end-members, including both upper and lower continental crust. Former Alpine and Adriatic subduction systems may have affected mantle sources of the SHO magma, whereas the HKS source was influenced by the Adriatic system, similar to the rest of the Roman Magmatic Province. A relatively recent thermal event, possibly promoted by detachment of the Adriatic slab, must have been responsible for the simultaneous melting of heterogeneous domains in the mantle column below the volcano that reflect superimposed imprints from multiple subduction systems.

Abnormal K-feldspars from the Lower Cambrian Hetang Formation in the Lower Yangtze Area: Implications for hydrothermal activities

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The Lower Cambrian black rock series are widely distributed throughout the Yangtze Platform in South China. At the lowermost part of the strata, there is a thin sulfide ore horizon rich in Cu, Mo, Co, Ni, PGE, Se, As, Hg, Sb, Ag, and Au. Based on geochemical characterization on certain segment of the strata, some researchers tried to figure out the formation mechanism of the horizon. However, no agreement on this question has been obtained yet, and the main argument is whether or not hydrothermal activities have played an important role in the formation process.

In this study, systematic analyses were carried out on the lithology and mineralogy of samples throughout the whole strata. Unexpectedly, abundant K-feldspars with abnormal composition were found. In terms of the electron probe microanalyses (EPMA), it is found that the K-feldspars can be subdivided into two types: Ba-rich K-feldspars and Ba-poor K-feldspars. The Ba-rich K-feldspar is characterized by high BaO content ranging from 1.34 % to 9.08 %; the K_2O and SiO_2 concentrations range from 7.24 % to 10.50 % and from 59.37 % to 69.70 %, respectively. The Ba-rich K-feldspar is found in veins, or occurs as thin rims of the Ba-poor K-feldspars in the matrix. The Ba-poor K-feldspar is depleted in BaO content ranging from 0.06 % to 1.08 %; the K_2O and SiO_2 content range from 5.22 % to 15.47 % and from 63.07 % to 73.13 %, respectively. The Ba-poor K-feldspar mostly occurs as anhedral grains in the matrix.

Furthermore, it is revealed that the plots of BaO and SiO_2 concentrations of the Ba-rich K-feldspar show a linear correlation, which is similar to those of hyalophane (or celsian). However, the K_2O-BaO relation is totally irregular. In addition, it is also observed that the K_2O-SiO_2 relation is basically linear, which shows that the K-feldspar could form in a continuous sequence from low K_2O content to high K_2O content; the endpoint could represent normal K-feldspars.

In conclusion, it is suggested that the K-feldspars were immature in composition and might precipitate from rapid cooling of hydrothermal fluids. We are searching for further evidence to support this new formation mechanism for abnormal K-feldspar.

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