GARNET-PHLOGOPITE WEBSTERITE XENOLITHS FROM THE PAMIR: SHALLOW MAFIC CUMULATES METAMORPHOSED AT HIGH PRESSURES, POTENTIAL SOURCES FOR (ULTRA)POTASSIC MELTS

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Rare garnet-phlogopite websterite xenoliths (hereafter "websterites") were found in an 11 Ma ultrapotassic diatreme from the southeastern Pamir that hosts a suite of dominantly K-rich eclogite and granulite xenoliths (HACKER et al., 2005). Understanding the websterites may contribute to revealing the nature of the deeper lithosphere beneath the Pamir and the sources of collision-related central Asian Cenozoic (ultra)potassic magmatism. The websterites equilibrated at 2.7 – 4 GPa and 950 – 1100 °C. Major and trace element geochemistry along with Nd and O isotopic data suggest that their protolith might have been a shallow, anhydrous mafic cumulate. The websterites preserve original major and compatible trace-element contents almost identical to those of pyroxenite cumulates from the Hustad igneous complex of the Western Gneiss Region of Norway (AUSTRHEIM et al., 2003). Their enrichment in volatiles and incompatible trace elements, including the formation of phlogopite, may be ascribed to interaction with K-rich fluids derived from surrounding felsic rocks. These results suggest that the websterites are parts of a subducted crust of which less refractory components, tonalites and metapelites, underwent high-pressure dehydration partial melting, producing residual sanidine eclogites and granulites (HACKER et al., 2005). In order to predict the fate of websterites exposed to further thermal relaxation, we conducted a series of calculations using the Adiabath_1ph program (SMITH & ASIMOW, 2005) running the thermodynamic database of GHIORSO et al. (2002). Isobaric dehydration melting calculated at 3 – 4 GPa yielded mainly (ultra)potassic liquids with major- and trace-element patterns resembling those of Tibetan (ultra)potassic lavas. Our calculations show that at the onset of melting websterites have mantle-like densities, whereas their melting residua at >3.5 GPa become progressively denser and are prone to foundering. The source region of much of the post-collisional (ultra)potassic lavas related to the India-Asia collision might have been dominated by phlogopite-enriched mafic crustal rocks similar to the websterites discussed here, rather than by K-metasomatized lithospheric mantle as previously suggested.

References

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