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Melt-Peridotite Reactions In The Upper Mantle: Geochemistry Of Peridotite And Pyroxenite From The Beni-Bousera Massif

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The Beni-Bousera massif contains ubiquitous pyroxenites of various types, organized into conspicuous layers ranging from 0.5 to 100 cm in thickness, hosted by peridotites. Integrated field features, petrographic observations, and geochemical analyses from 92 samples (whole rock major and trace elements data: 55 samples, microprobe data for minerals: 48 samples, and mineral trace elements data: 30 samples) from pyroxenites provide information to classify the rock types into four different groups typified as: (1) garnet pyroxenites, (2) spinel-garnet websterites, (3) spinel websterites, and (4) spinel chromium websterites. Type 1 rocks, occurring at the base of the massif, are considered as the most primitive type, garnet pyroxenites layers represent the vestiges of an old veined subcontinental lithosphere. They generally indicate temperatures $<970^{\circ}C$ (based on two-pyroxene thermometry) and a low to very low Mg# ($<76\%$). Trace element contents show enrichment in heavy and middle rare earth elements but strong depletion in light rare earth elements (LREE). Paradoxically, the host peridotites show enrichment in LREE, which give new insights into their genesis history. Based on our field observations and geochemical results, we suggest that garnet-pyroxenite layers metasomatised the host peridotite successively by the partial melting as a consequence of subsequent heating phase(s) of the lithosphere. The magmatic event that led to the diversity and zoning of mafic layers was caused by melting of the base of thinned subcontinental lithosphere by upwelling asthenosphere, followed by infiltration of asthenospheric melts. The different groups of mafic layers record several stages of this event.

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