Trace element distribution between coexisting clinopyroxene and amphibole in xenoliths from western Victoria, Australia

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Clinopyroxene is normally regarded as the main host phase for trace elements in the mantle. In a mantle volume affected by modal metasomatism phases such as amphibole and apatite provide additional residence sites for trace elements, changing its trace element budget dramatically.

This work presents the results of detailed geochemical study of a suite of xenoliths from Western Victoria, Australia. A wide compositional range of xenoliths containing variable proportions of amphibole, apatite and phlogopite were selected and the trace element abundances of coexisting phases determined *in-situ* using laser ablation microprobe ICP-MS. Amphibole structure was determined by SREF at the C.N.R.-IGG of Pavia and compared with those experimentally determined (e.g., Tiepolo et al 2001).

The xenoliths considered here exhibit varying degrees of metasomatic enrichment as indicated by the rare earth element patterns of both clinopyroxene and amphibole.

High field strength element (HFSE) ratios (Zr/Hf, Nb/Ta) vary with both amphibole crystal chemistry (e.g., Ti content) and overall degree of metasomatic enrichment (e.g., La_N/Yb_N), as shown in the figure below.

These results have important implications for interpretation of HFSE ratios in mantle-derived melts. The presence of amphibole in the source region, its crystal chemistry and the type of metasomatism affect the trace-element budget of the mantle wall-rock, and the trace element signature of derived melt fractions.

References

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Geochemical And Fluid Inclusion Characteristics Across The Archaean Dharwar Craton And Late Archaean Nilgiri Granulites, South India

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The Dharwar craton (DC) comprising of green schist to amphibolite facies rocks at the southern margin of the Indian sub continent is bordered by the granulite terrains of the Nilgiri (NG), Biligirirangan (BRG) and Shevaroy hill ranges. These granulites represents the deepest southern most extension of the DC.

A N-S traverse across the southern part of the DC, the NG and the separating Moyar shear zone (MSZ) [1] has been investigated to characterize the geo chemical signatures.

Enderbitic charnockites of Nilgiri hills, are tonalitic to granodioritic in composition and the K/Rb ratio indicate igneous parentage for these rocks. The Nilgiri enderbitic charnockites are characterized by the high density CO2 –rich inclusions (0.85-1.15g/cc).

Geo-chemical analyses of samples collected serially across the enderbitic charnockite and retrogressed counter parts within the Moyar shear zone show tonalitic composition. Major and trace element plots show significant mobility of elements such as increase in SiO_2 and K/Rb, and decrease in Al_2O_3, Feo^t, Cao, Zr and Y across the enderbitic charnockite-gneiss transition zone which is attributed to the circulation of fluids during shearing and rehydration.[2] Composition of the fluid inclusions across the enderbitic charnockite-gneiss transition zone varies from CO_2-rich (0.85-0.92 g/cc) to H_2O (0.87-0.96 g/cc; 5-10 mole% Nacl equv.) rich.

Amphibolite facies gneisses are granitic in composition and K/Rb ratio of amphibolite facies gneisses indicate mantle composition. Fluid inclusion composition in amphibolite facies gneisses varies from CO_2-rich (0.95-1.00 g/cc) to H_2O-rich (0.90-0.96 g/cc).

Geochemical, fluid inclusion characteristics and lithologic contrast coupled with regional structural features and metamorphic characterization identify the Moyar shear zone as a major terrane boundary and tectonic suture which was reactivated several times.

References:

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