

MULTISTAGE METASOMATISM IN ULTRAHIGH PRESSURE MAFIC ROCKS FROM THE NORTH DABIE COMPLEX (CHINA)

MALASPINA, N.¹, HERMANN, J.², SCAMBELLURI, M.¹ & COMPAGNONI, R.³

¹Dipartimento per lo Studio del Territorio e delle sue Risorse, corso Europa, 26, 16132, Genova, Italy

²Research School of Earth Sciences, the ANU, Mills Road, 0200, Canberra ACT, Australia

³Dipartimento di Scienze Mineralogiche e Petrologiche, via Valperga Caluso, 35, 10125, Torino, Italy
e-mail: malaspina@dipteris.unige.it

We present a petrologic and geochemical study of ultra-high pressure (UHP) rocks from the Northern Dabie Complex (China). The investigated samples are eclogites s.l. included in meta-lherzolitic bodies, which are in turn enclosed by leucocratic gneisses. The textural relations among the various rock-forming minerals enabled us to identify several recrystallisation stages. The peak (UHP) association is a garnet-clinopyroxene-rutile paragenesis. UHP garnet and clinopyroxene display segregations of polycrystalline rods of rutile+ilmenite and of albite, K-Ba-feldspar and quartz, respectively. Post peak parageneses correspond to ilmenite + amphibole, stable at HP conditions, and granulite-facies coronas around garnet. The bulk-rock major and trace element compositions of this eclogites indicate basaltic rocks with MORB and E-MORB affinity as protolith. Compared with such basalts, the studied rocks show strong depletion in SiO₂ and alkalis and enrichment in MgO and FeO, likely indicating an element exchange with ultramafic rock systems. On the other hand, the trace element compositions of the bulk rocks show strong enrichment in Cs, Ba and Pb, associated with moderate enrichment in Rb, K and Th. The same characteristic enrichment and fractionation is recorded by peak metamorphic clinopyroxene. Therefore, the bulk rock and mineral trace element patterns indicate influx of crustal fluids during subduction. Because retrograde amphibole and clinopyroxene does not show such features, the metasomatism must have occurred prior to or during UHP metamorphism.

The observed features in the studied eclogites provide evidence for two stages of metasomatism. The first stage features the influx of Si-undersaturated and Mg-rich fluids, a process that likely occurred under low-grade metamorphic conditions, and possibly related with the serpentinization of the associated lherzolitic rocks (SCAMBELLURI & RAMPONE, 1999; YANG, 2003). A second stage of metasomatism was accompanied by the influx of crustal fluids transporting LILE and light elements. This stage likely record the tectonic coupling at HP to UHP with the associated crustal rock units and provides insight into the trace element mobility in deeply subducted crustal rocks.

References

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