

Geochemistry of ultramafic veins in the Ulten Zone peridotites

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The Ulten Zone orogenic peridotite (Northeastern Italy) contains ultramafic veins ranging from rare garnet-amphibole websterite and orthopyroxenite to more abundant amphibole-rich rocks. These ultramafic veins provide the opportunity to gain information on channelled melt/fluid flow at different depths in a suprasubduction mantle wedge. Garnet-amphibole websterite occurs within high-pressure garnet-amphibole peridotite whereas the other ultramafic vein types cut low-pressure spinel-facies, amphibole-peridotite. The contacts between the ultramafic veins and the peridotite host are sharp and no crosscut relationships between the different vein types have been observed. The garnet-amphibole websterite resulted from the subsolidus equilibration at $T = 1075^{\circ}\text{C}$ and $P = 2.2$ GPa of former garnet-free pyroxenite whose parental mantle melt intruded the host peridotite under high-temperature/low-pressure conditions ($T > 1400^{\circ}\text{C}$, $P < 1.25$ GPa) [1]. The calculated melts in equilibrium with clinopyroxene is characterized by Ba, Nb, Pb, Sr and LREE enrichment relative to N-MORB and by a strong HREE depletion relative to LREE ($\text{La}/\text{Yb} \sim 314$), suggesting an alkaline affinity for the parental melt. The amphibole-rich veins contain Mg-hornblende (> 90 vol%, generally with tremolitic rims) and trace amounts of pyroxenes, olivine, Cr-spinel and scapolite. Thermobarometric calculations on an orthopyroxene-clinopyroxene-bearing amphibole-rich vein indicate equilibration at $T = 700\text{-}800^{\circ}\text{C}$ and $P < 1.7$ GPa. The amphibole-rich veins show geochemical similarities with the garnet-amphibole websterite, such as LREE enrichment ($\text{La}_N/\text{Sm}_N = 1.3\text{-}3.7$) over MREE and HREE, which in turn are depleted relative to MREE ($\text{Sm}_N/\text{Yb}_N = 1.3\text{-}1.7$). In addition, LILE/HFSE > 1 and significant concentrations of U and Pb (both between 10-100 times the primitive mantle concentrations) suggest a strong crustal contribution to the liquids that gave rise to the ultramafic veins. We speculate that the amphibole-rich veins formed from crustal-derived fluids at relatively shallow depths; their solute-rich character may be related to high fluid-rock ratio.

[1] Nimis P., Morten L. (2000) *J. Geodyn.* **30**, 93-115.

Is Paleozoic ocean-chemistry coupled with epeiric seawater isotope records?

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Isotopes of epeiric sea rocks and fossils are used to construct seawater records for modeling global changes in Paleozoic ocean chemistry, climate, and for intercontinental correlation. We present for the first time geochemical results of Paleozoic brachiopods from open ocean Permian-Carboniferous seamounts of Japan situated in the tropical mid-Panthalassic Ocean. Strontium isotope values of brachiopods from the Panthalassic and Paleotethys (South China) Oceans are coupled with those of coeval specimens from epeiric seas of North America, Europe and Russia ($p = 0.393$), but not with those of epeiric-sea whole rocks ($p = 0.029$) and conodonts ($p = 0.031$). Oxygen isotope values of brachiopods from the Panthalassic and Paleotethys exhibit mixed results with studies of counterparts from epeiric seas ($p = 0.469$) reflecting overprinting of local environmental conditions on global trends. Carbon isotope values of brachiopods and whole rock from the Panthalassic and Paleotethys Oceans are generally dissimilar to those of coeval material from epeiric seas of North America, Europe and Russia ($p = 0.001$ and 0.003 , respectively). Factors such as water mass stratification, evaporation, dilution, depth, temperature, and carbon burial/oxidation variations within the local environment probably influenced the chemistry of the fauna and accumulating sediments in epeiric seas. This decoupling of carbon and oxygen isotope values from the open ocean with those from epeiric seas, suggests caution in the use of isotope results from epeiric seas for international correlation, for constructing global seawater records, for determining fluxes in the global carbon cycle, and for modeling climate changes and atm. carbon dioxide levels.

