A tale of two ledges in the carbonated peridotite space

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The influence of CO_2 in shaping almost four decades of thoughts on the low-velocity zone in the oceanic mantle, the genesis of magmas at mid-ocean ridges and their link with carbonatitic liquids, the debate centering on the relationship of carbonatitic melts to other silica-undersaturated liquids on the continents and subduction zones, the isssue of carbonatites coexisting with salts and hydrous siliecous melts entrapped in fibrous diamonds, the development of 'waves' of carbonatite-induced metasomatism as frequently witnessed in diamond guests, driving the element fluxes in the source regions of continental kimberlites/carbonatites, and controls on the growth of some diamonds and their guests from calcio-magnesiocarbonatites at great depths (>500 km) in the Earth, is simply tremendous. Despite this stated significance, melting phase relations that are crucial to understanding all of the above, either at very low or much elevated pressures remain largely unknown, a situation that can be understood only by studies of model systems.

Here, melting phase relations of carbonated peridotite are presented in CMAS-CO_2 (2.1-3 GPa) and CMS-CO_2 (12-26 GPa) space. The details of the very prominent, although previously uncharted, low-pressure carbonate ledge in CMAS-CO_2 have been experimentally determined here. Formerly, it was also concluded that instead of exhibiting sharp changes, the solubility of CO_2 in mantle-derived liquids has a gradual, soft tone. In sharp contrast to all previous inferences, experiments presented here demonstrate that there is considerable slope to the carbonate ledge, which starts to become visible first at 2.3 GPa/1425°C and ends at 3 GPa/1225°C. Liquids are calciocarbonatites (molar Ca# = ~60-63) all along this ledge, a feature that extends to at least to 2.1 GPa, even before the ledge develops. The second ledge develops in CMS-CO_2 between 14 (1625°C) and 16 GPa (1510°C), corresponding to differential temperature of 115°C. Therefore, at much elevated pressures, the solidus of carbonated peridotite has a second sharp decrease in temperature. At 16-20 GPa, liquids are calciocarbonatites (Ca# = ~61), reverting to magnesian character (Ca# = 35-40) at 12-14 and >20 GPa. Hence, sharp changes occur in melting phase relations of carbonated peridotite at both low and elevated pressures. The experimental observations given here warrant a thorough and concerted examination of magma genesis and related issues across a range of depths in the Earth.

Metamorphism in Chah savar agha-Chah gaz ophiolite

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The Chah savar agha -Chah gaz ophiolites are following the Neyrez ophiolite collection wich is located in Fars province in South-western of Iran.

This mass has formed at the Permian period and the time of its replacement is related to the upper Cretaceous and Paleocene period.

The ophiolite of this era consist of:

Mantle part, most of it, is Harzborgite, and Cumulate part , most of it, is Olivin Webstrite and Olivin Gabro and the next part is Diabazic dyke and pillow lava that are metamorphed and complexed with turbidite -Radiolarite subzone.In this region have seen 4 kind of metamorphism :

1- Hydrothermal metamorphism that occurred in Mantle and ultramaphic part that consist of Serpentinization, Talkization and Rodingitization.

2- Dynamic metamorphism that is caused tectonic texture in mantle part.

3- Regional metamorphism that is metamorph Turbdite - Radiolarite subzone under green schist facies.

4- Contact metamorphism and Skarn formation that are related to the Marbels in the ophiolite that is formed Marbels mines and kinds of skarn.