Metamorphic perspective of Sri Lankan UHT rocks for future studies

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Metapelitic granulites around Gampola in central Sri Lanka have been subjected to ultra-high temperature (UHT) conditions of metamorphism as they preserve diagnostic mineral assemblages such as orthopyroxene + sillimanite + quartz, spinel + quratz, sapphirine + quartz, and osumilite. UHT rocks have been reported from over the world and they provide important information as to the origin and evolution of continental crust. This paper tries to highlight some outstanding features of Sri Lankan UHT granulites for future studies.

1. P-T evolution

The metamorphic rocks in the Highland Complex in Sri Lanka preserve a clockwise P-T trajectory as evidenced by prograde kyanite inclusions in garnet (Ogo et al., 1992; Hiroi et al., 1994). Recent petrographical discoveries related to P-T trajectories are;

- Mg-rich staurolite and its breakdown products (Yanagi and Hiroi, 2009)
- Sapphirine + quartz association in garnet (Yanagi and Hiroi, 2009)
- Osumilite and spinel + quartz inclusion in garnet (Sajeev and Osanai, 2004a, b)

These minerals and mineral assemblage are potentially additional information to our knowledge for constructing more detailed P-T history of the Sri Lankan UHT granulites.

2. Geochronology

Geochronological data are not sufficient to discuss the metamorphic evolution of the Sri Lankan UHT rocks in time. Motoyoshi et al. (2004) reported preliminary results of EMP U-Th-Pb dating on monazite in the metapelitic rocks, and they yielded ~580 Ma for monazite in garnet and ~560 Ma for those in the matrix. We need to conduct more geochronological work not only to constrain the metamorphic evolution of the Sri Lankan UHT rocks but to correlate these data with other Gondwana fragments in particular Southern India and East Antarctica.

3. "Nanogranite" textures in UHT environment

Y. Hiroi found a puzzling microstructures in Sri Lankan UHT rocks. They are "nanogranite" microdomains as inclusions in garnet porphyroblast. The "nanogranite" demonstrates dendritic textures which are indicative of quenching after melt component. It is not unreasonable that the UHT granulites once contained melt therein, but the question is how they have cooled rapidly enough to form quenching textures under the high temperature metamorphic conditions. We need any reasonable interpretations for this strange phenomenon, from which we can obtain new insights into lower crustal processes.

4. Charnockite formation revisited

Formation of charnockite in Sri Lanka and Southern India, that is so called "charnockite in the making", "incipient charnockite", or "arrested charnockite", have long been a target to examine the granulite-forming process in deep crust. Although several hypotheses have been proposed so far, we have not reached any definite conclusion with respect to its mechanism or process. By combining geological, petrological, geochemical and geochronological approaches, we should uncover this phenomenon of great interest. We can also examine the charnockite formation by taking data from other Gondwana fragments as Southern India and East Antarctica.

References

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