Serpentinization and carbonation of dunites in the western part of the Isua Supracrustal Belt, Southwestern Greenland

*Juan Miguel Ramirez Guotana[1], Tomoaki Morishita[1], Akihiro Tamura[1], Ikuya Nishio[1], Kenichiro Tani[2], Yumiko Harigane[3], Kristoffer Szilas[4], D. Graham Pearson[5]

1. Kanazawa University, 2. National Museum of Nature and Science, Japan, 3. Institute of Geology and Geoinformation Geological Survey of Japan/AIST, 4. University of Copenhagen, 5. University of Alberta

The 3.7 Ga Isua supracrustal belt (ISB) hosted in Itsaq Gneiss Complex in southwestern Greenland preserves one of the oldest metamorphosed mafic-ultramafic complex in the world which provides opportunity to study early petrological processes on Earth. Ultramafic bodies are common throughout the Isua supracrustal belt. These ultramafic rocks are interpreted to be possible mantle residues while other studies consider a cumulate origin. In the western limb of the ISB, less altered dunitic bodies enveloped by metasomatized dunites and amphibolites are exposed. The studied dunite lens is also referred as Lens B by previous studies. The northern part of Lens B dunites are highly deformed, highly serpentinized and carbonatized. The central and lower Lens B are less deformed and composed of olivine, serpentine, magnesite, magnetite, stichtite and Ti-rich humites. Ti-chondrodite (Ti-Chn) and Ti-clinohumite (Ti-Chu) are present in the central and southern part of Lens B. Ti-Chn and Ti-Chu occur commonly as irregular patches in olivine. In some portions, intergrowths of Ti-Chn and Ti-Chu are present. The F contents of the the Ti-Chn and Ti-Chu are also very low. Olivine grains are highly forsteritic and are comparable to those derived by deserpentinization process. The major serpentine phase is antigorite which occur as platy grains and minor amounts as inclusion in olivine. Stichtite, a magnesium-chromium hydroxycarbonate mineral, also includes clinohumite minerals. The clinohumite intergrowth in ISB dunites can be associated to the breakdown of Ti-Chn to Ti-Chu (Ti-Chn+Atg+Ol=Ti-Chu+H2O). The clinohumites are also almost F-free which suggests a lower temperature within the antigorite stability field compared to F-bearing clinohumites. Petrographic and geochemical results suggest that the dunites reached P-T conditions within the Ti-Ch and Atg stability field and retrogressed and carbonated (stichtite and magnesite) at lower pressure and temperature where Ti-Chu is stable.

Keywords: Isua Supracrustal Belt, archaean, peridotites

©2019. Japan Geoscience Union. All Right Reserved.