Eoarchean high－P/T metamorphism from Isua Ultramafic rocks: implications for elemental mobilization

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Ultramafic rocks in the 3.8-3.7 Ga Isua supracrustal belt (ISB) in southwestern Greenland were interpreted as cumulates or possibly the oldest mantle relicts exposed on Earth [1, 2]. In this study, we explore the metamorphic imprints on the two ultramafic bodies in the western limb of the ISB (Lens A and Lens B). In Lens B, Ti-rich humite-type minerals ($nM_2SiO_4 \cdot M_{1-x}(OH,F)_{2-2x}Ti_xO_{2x}$) such as titanian chondrodite (Ti-Chn) and titanian clinohumite (Ti-Chu) occur as accessory phases forming patches within olivine [3]. The host olivine contains abundant magnetite inclusions. The high forsterite content (Fo=96-98) and variable MnO and NiO of the host olivine indicate a metamorphic origin as a result of deserpentinization rather than primary igneous features. Pressure stability at 2.6 GPa for Ti-Chn co-existing with olivine was proposed by recent experimental works [4]. The intergrowth relationship between Ti-Chn to Ti-Chu formed as a result of breakdown during decompression. The overall petrological and geochemical features of the ISB ultramafic rocks reached eclogite facies conditions following deserpentinization. Lens A exhibit textural and geochemical features (Fo=89-92) that are different from Lens B. Olivine contains pyroxene-spinel symplectites which could be associated with coexistence with a Cr-rich melt and subsequent dissociation during cooling [5].

[1] Friend & Nutman (2011) *Geology* **39**, 663–666. [2] Szilas *et al.* (2015) *Gondwana Res* 28, 565–580. [3] Dymek *et al.* (1988) *J Petrol* **29**, 1353–1397. [4] Shen *et al.* (2014) *J Petrol* **56**, 1425–1458. [5] Arai (1978) *EPSL* **39**, 267–273.