The origin of > 3,8 Ga peridotites, south of Isua region, SW Greenland

J. VAN DE LOECHT[1], C. MÜNKER[1], J. E. HOFFMANN[2], R. KLEINSCHRODT[1], D. GRABE-SCHÖNBERG[3] AND M. T. ROSING[4]

[1]Universität zu Köln, Germany; loechtj@uni-koeln.de
[2]Freie Universität Berlin, Germany
[3]Universität Kiel, Germany
[4]Natural History Museum, Copenhagen, Denmark

The Eoarchean Itsaq gneiss complex (IGC) of southern West Greenland comprises ultramafic units, that have been proposed to represent remnants of mantle peridotites or cumulates, with ages of >3.8 Ga [1]. In this study we investigated in detail the petrology, major and trace element geochemistry and Hf-Nd isotope composition of pristine ultramafic rocks from the area south of the Isua Supracrustal Belt (ISB) to place constrains on their origin. Compositions of fresh olivine reveal that some samples with Fo#<89 clearly have a cumulate origin, but some samples with Fo# 89-92 and high Ni contents in olivine overlap compositions of younger mantle peridotites. In agreement with previous studies, some of the studied samples reveal similarities to modern mantle peridotites (e.g. Mg/Si vs. Al/Si, Ni and low CaO contents).

REE abundances in the peridotites are near chondritic, but the samples are less LREE-depleted than modern peridotites (LaN/YbN from 0.31 to 1.37) similar in some cases to basalt cumulates reported from the ISB [2]. All samples exhibit small negative Nb-Ta anomalies, consitent with compositions of Isua basalts that are interpreted to have a subduction related origin.First Hf-Nd isotope analyses by MC-ICP-MS yielded positive εHf(3.85)from +1.5 to +6.0 and εNd(3.85) from +1.1 to +4.7. 176Lu/177Hf range from 0.02675 to 0.06705 and 147Sm/144Nd from 0.1883 to 0.2506. In εHf(t)-εNd(t) space, the initial εHf and εNd values overlap with those reported for tholeiitic metabasalts and TTGs of the Isua region [3], mirroring the characteristic decoupling of Hf-Nd isotope compositions in the Eoarchean mantle source of Isua rocks that is not found in younger rocks. Both Lu-Hf and Sm-Nd data plot on an errorchron close to the minimum age of 3.81 Ga as defined by crosscutting tonalites [1]. This pattern confirms only minor isotopic disturbance of both Hf and Nd isotope systems.

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