Geophysical Research Abstracts
Vol. 16, EGU2014-6956-1, 2014
EGU General Assembly 2014

Magmatic origin of alkaline meta-igneous rocks from Chamberlindalen, SW Svalbard

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This study focuses on the late Neoproterozoic meta-igneous rocks of SW Svalbard to determine their magmatic evolution, conditions of magma storage and origin. The samples from the Chamberlindalen area form an alkaline igneous suite, from which thin dikes and intrusive bodies have been collected. The rocks in question intrude Late Neoproterozoic metasediments and are surrounded by occurrences of Neoproterozoic metabasalts in contrast to highly alkaline the Chamberlindalen intrusions.

The rocks from Chamberlindalen are divided into two groups based on their geochemistry, mineralogy and field relationships. The dikes, classify as minettes, belonging to the lamprophyre group and contain mainly euhedral, elongated phlogopite and additionally clinopyroxene and feldspar. The rest of the samples are highly magnesian and are classified as alkali gabbro. The alkali gabbros contain primary magmatic minerals such as clinopyroxene, calcic amphibole and mica in different proportions. The alkali gabbros are enriched in LREE and HFSE and depleted in P, K and HREE. The minette dikes are always more enriched in HFSE and REE in comparison to the alkali gabbros. The mineral chemistry of the alkali gabbros reveals that pyroxenes are represented by diopside with Wo_{46-51} En_{35-46} Fs_{6-14}, and calcic amphibole by kaersutite. The Mg# number for diopside is from 72 - 88, whereas for kaersutite Mg# number is 51 - 74. Thermobarometry calculations for diopside and kaersutite have been performed. In the alkali gabbros from Chamberlindalen, diopside crystallized between 0.7 - 8 kbar and 1152 - 1233°C. Results for kaersutite reveal that they crystallized between 5 - 17 kbar and 1043 - 1215°C.

For diopside the main crystallization was between 10 and 38 km, whereas for kaersutite, the main crystallization was between 30 and 50 km. Clinopyroxene and minor kaersutite also show a zone of crystallization at 2 to 10 km. This reflects a main crystallization zone at 10 - 50 km throughout the continental crust and a shallower zone of emplacement at 2 - 10 km.

The geochemistry of the alkali meta-igneous suite at Chamberlindalen will be compared with local greenstones and their trace elements geochemistry will be used to discuss their origin.

This research is supported by NCN No.2012/05/N/ST10/03594