Geophysical Research Abstracts
Vol. 18, EGU2016-7460-1, 2016
EGU General Assembly 2016

Kyanite-garnet gneisses of the Kåfjord Nappe – North Norwegian Caledonides: P-T conditions and monazite Th-U-Pb dating

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The Kåfjord Nappe is the part of the Skibotn Nappe Complex traditionally ascribed to the Upper Allochthon of the North Norwegian Caledonides. Pressure-temperature (P-T) conditions and metamorphic age of the Kåfjord Nappe are not well constrained, geochronological data are limited to a single Rb-Sr age of c. 440 Ma (Dangla et al. 1978).

Metamorphic evolution of kyanite-garnet gneisses of the Kåfjord Nappe is presented here. The kyanite-garnet gneisses are associated with a few meters thick amphibolite lenses. The gneisses mainly consist of quartz, plagioclase, biotite, muscovite, garnet, kyanite, and rutile. Retrograde minerals are represented by sillimanite and chlorite. Garnet occurs as two textural types. Garnet-I forms euhedral porphyroblasts with multiple small inclusions. Profiles through garnet-I show chemical zonation in all components. The composition varies from Alm64–68Prp11-16Grs13-18Sps2-8 in the core to Alm68–70Prp17-18Grs10-13Sps1-3 in the rim. Garnet-II is subhedral to anhedral, its core is inclusion-rich, whereas rim contains only single inclusions. Chemical composition of garnet-II is similar to that of the garnet-I rim.

P-T conditions have been estimated using the garnet-biotite-muscovite-plagioclase (GBPM) geothermobarometer (Holdaway, 2001; Wu, 2014). Calculated peak P-T metamorphic conditions are 610-625 °C and 7.6-8.2 kbar corresponding to the amphibolite facies conditions. Phase equilibrium modelling in the NCKFMMnASH system yields peak metamorphic conditions of c. 620 °C at 8 kbar. Growth conditions of garnet-I core modelled in the NCKFMMnASH system are c. 570 °C at 9.7 kbar.

Chemical Th-U-total Pb monazite dating has been performed. Preliminary dating results from the kyanite-garnet gneiss of the Kåfjord Nappe yield an array of dates from 468 Ma to 404 Ma. There is a correlation between an increase of yttrium content and decrease of monazite single dates. Compositional maps confirm an increase of yttrium towards the rim of the monazite.

This work is partially funded by AGH research grant no 11.11.140.319.

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