Geophysical Research Abstracts, Vol. 7, 08575, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08575

Dating and Petrogenetic Comments on the Net-veined late Proterozoic Vrådal Complex, South Norway

A.-M. Christensen (1), P.M. Holm (2) and J. Konnerup-Madsen (2)

(1) Institute of Mineralogy, Würzburg, Germany
(anne-mette.christensen@mail.uni-wuerzburg.de / Fax: +49 9318884620), (2) Geological Institute, Copenhagen, Denmark

The Vrådal intrusive complex within the central part of the Telemark Sector belongs to the Sveconorwegian suite of post-tectonic granites emplaced after this orogeny in southern Norway. The generation of the intrusion is thought to be related to uplift of the Sveconorwegian fold-belt and the emplacement is considered to be related to movements along the major shear-zones in the area.

The intrusion itself, is composite and consists of several discrete phases: porphyritic granite (PG), equigranular granite (EG), monzonitic to dioritic units (MZ), monzonitic dikes (MD) as well as hybrid phases (HQM). Chemically, all units are meta-aluminous with clear calc-alkaline evolution trends; the PG unit representing the most evolved composition. Trace elements show almost identical subduction type patterns for all rock-types and testify to extreme enrichment of Ba, Rb, Th, K, La, Ce and Sm with lower abundances recorded for the elements Ta, Nb, Y, Yb.

The EG unit is, following field evidence along with trace – and isotope geochemical modelling, considered to be crustally derived. Nd and Pb isotope data suggest a Svecofennian or early Gothian age of the precursor with a predominantly upper crustal signature.

Low contents of MgO ($<$ 4 wt %), Ni ($<$ 58 ppm) and Cr ($<$ 77 ppm) along with marked negative Nb-Ta anomalies for both the MZ and PG units, indicate that the melts giving rise to these were not primitive and, in addition to an enriched mantle component also contain lower crustal material. The isotope compositions of these units can be adequately explained by different degrees of binary mixing between a mantle-derived melt similar to the Feda gabbroic lamproite of Bingen et al., (1993):

εNd: +0.33; εSr: +51.97 and a lower crustal end-member similar to the lower crustal segment of Andersen (1997) (εNd: -8.88; εSr: +60). This model is consistent with mixing-lines defined by the Pb-isotope compositions. Hybridization and mixing in the source-region between the highly evolved mantle-derived melt and melts generated by melting of lower crustal material are invoked as the process. The lower crustal component constitutes around 78 wt % of the samples, testifying to a significant degree of underplating to generate the necessary heat for crustal melting. Using Rb/Sr systematic, an emplacement age of 962 +/- 12 Ma is suggested for the complex.