BEHAVIOUR OF REE IN ZIRCON DURING CHARNOCKITIZATION – A CASE STUDY FROM SÖNDRUM, SW SWEDEN

A. Rimša (1), M. J. Whitehouse (1), and L. Johansson (2)

(1)Laboratory for Isotope Geology, Swedish Museum of Natural History, (2) Geological Institute, Lund University (andrius.rimsa@nrm.se/Fax: +46-8-5195-4031)

High grade metamorphic rocks occurring in the Eastern Segment of Sveconorwegian orogen, SW Sweden are dominated by migmatized granitic gneisses locally re-crystallised into charnockite. At the Söndrum quarry charnockite forms distinct ca. 2 m wide symmetrical margins to a ca. 0.5 m wide pegmatitic dyke. The transition from charnockite to migmatized gneiss is gradual on a decimetre scale. In some parts of the charnockites a weak migmatitic structure is preserved, clearly indicating that charnockitization overprints migmatitic fabric. In this study we focus on changes in zircon chemistry and microtextures induced by migmatization and charnockitization using SIMS and cathodoluminescence (CL) imagining.

On the basis of CL imagining and SIMS U-Pb zircon geochronology we identify three generations of zircon growth present in all lithologies: (1) 1.7 Ga – dark CL protolith zircons show oscillatory zoning patterns (OZPs); (2) 1.55 Ga – secondary bright CL structures altered the protolith zircons to a various degree. They show blurred primary OZPs but are mainly featureless. The age is most probably linked to the migmatization; (3) 1.40 Ga – featureless rims (all lithologies) or newly formed zircon (pegmatitic dyke only) black in CL images, associated with pegmatitic dyke intrusion and charnockitization. In the gneiss, these rims are rare and thin whereas in the charnockite and the pegmatitic dyke they are common and reach considerable thickness at the crystal termination.

All three zircon populations have a distinct Hf concentration. Th/U ratio for the protolith zircons is 0.25–0.4, but much higher (0.6–0.7) for migmatization sectors and very low for the 1.40 Ga rims and newly formed zircons (0.25–0.03). Normalised REE
patterns show smooth trends with positive Ce and negative Eu anomalies. The HREE show similar steeply increasing trends towards Lu end of the graph for all the zircon generations. Only minor variations in (Gd/Lu) normalised ratio were observed. The protolith zircons have an almost flat LREE, which we assume is a primary magmatic feature. The 1.55 Ga zircon generations has a much steeper trend, which we interpret as due to expulsion of large cation radii LREE during solid state recrystallization of protolith zircons. The 1.40 Ga newly formed zircons and rims have steep LREE trend as well. The most probable explanation is that the REE pattern of 1.40 zircons and rims largely reflects equilibrium partition behaviour.