Li, Be, B and $\delta^{11}B$ values from the peralkaline Ilimaussaq intrusion and its country rocks (South Greenland)

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The Ilimaussaq intrusion is characterized by four progressively more fractionated magmatic pulses: (1) augite syenite, (2) peralkaline granite and (3+4) agpaitic nepheline syenites. The peralkaline granite is interpreted as a contaminated equivalent of the augite syenite. Evidence for late-stage hydrothermal activity is present as veins penetrating all units. The intrusion is partly hosted by supracrustals, partly by the Proterozoic Julianehåb granite.

Li, Be and B contents, as well as $\delta^{11}B$ ratios have been measured with SIMS (secondary ion mass spectrometry) in all important primary and secondary minerals from the different rock types of the Ilimaussaq intrusion and the Julianehåb granite to understand the behaviour of the light elements during differentiation of an alkaline magmatic system. The main Li carrier in the system is Na-rich amphibole, with a maximum Li content of 6000 µg/g in the foyaites and naujaites, but with only 50 µg/g in the early Ca-rich amphiboles of the augite syenites. The highest Be contents occur in late-stage hydrothermal aenigmatite (500 µg/g), followed by nepheline (16-100 µg/g) and sodalite (15-60 µg/g). The main B carrier of the rocks is sodalite with maximum contents of 120 µg/g. $\delta^{11}B$ measured in most amphiboles is about –20 ‰ and displays closed-system behaviour in the inner part of the Ilimaussaq intrusive rocks, but rises in the augite syenites from –20 to –7 ‰ towards the contact with the Julianehåb granite. $\delta^{11}B$ in amphiboles from the Julianehåb granite close to the contact is between –5 and –7 ‰. Identical behaviour is observed in biotite, quartz and feldspar; i.e. $\delta^{11}B$ increases from the inner part of the intrusion towards the augite syenite. In the immediate contact zone, $\delta^{11}B$ values of the granites lie in the same range as in the augite syenite or are even higher and decrease with distance. We interpret this behaviour of $\delta^{11}B$ to indicate a loss of the comparatively fast diffusing ^{10}B relative to ^{11}B via peralkaline fluids infiltrating the neighbouring granites. Equilibrium between the fluids, the granites and the augite syenites appear not to have been attained. Li contents, Li isotope data and further trace element concentrations support the transport of light elements via a peralkaline fluid phase out of the intrusion and into the country rocks (see Abstract by Marks *et al*., this volume).

Melt inclusions from the Barberton Greenstone Belt, South Africa

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Melt inclusions from komatiites in Archean Greenstone Belts can increase our understanding of the origin of ultramafic magmas. However, the question of whether old inclusions preserve original magmatic compositions has to be answered first. To address this problem, we have studied melt inclusions from the southwestern part of the Barberton Greenstone Belt with visual heating experiments. Our sample is a partially serpentinised olivine cumulate with olivine relicts of Fo93-94 composition.

Unheated inclusions show a variety of petrographic textures. Inclusions range from mostly glassy to crystalline. The morphology of the inclusion edges varies from smooth edges to many irregular protrusions at the edges. The origin of these different morphologies is not yet fully understood.

Inclusions that were visually inspected during heating behave similarly. Melting starts at 800-900ºC. A vapour bubble forms and gets smaller with increasing heating indicating that the system is closed. At a peak experimental temperature of 1360ºC a small bubble is still present., and the melt is in the olivine-only field. Inclusions were not heated to a higher temperature to avoid H_2 loss during experiments. After initial experiments, subsequent inclusions were quickly heated to a temperature of 1360ºC, held for 30s and quenched to try to preserve olivine rim compositions and volatile contents. The relative proportions of the bubble and inclusions sizes are approximately constant, except for a few selected altered looking inclusions where a large expanded bubble is observed.

FeO content of reheated inclusions shows a negative correlation with Fo-content of host olivine, which is indicative of re-equilibration during cooling (Danyushevsky *et al*., 2000). Major element compositions of inclusions have been recalculated to correct for Fe-loss. Inclusions larger than 35 microns and with `normal' bubble sizes show coherent major element trends. Smaller inclusions have lower MgO outside the main trend, probably caused by poor quenching.

Compositional profiles have been analysed across the olivine rims around several inclusions in order to constrain the cooling hystory of the individual olivine grains (Danyushevsky *et al*., 2002).

We will present major, trace and volatile (H_2O, Cl, S) contents of the melt inclusions and their host olivine phencorysts and use them to estimate the composition and temperature of the parental melt and the conditions of its evolution.

References

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