European Mineralogical Conference
Vol. 1, EMC2012-595, 2012
European Mineralogical Conference 2012

Constraining magmatic processes and residence timescales of clinopyroxenes from the Nola Seamount, Cape Verde Islands

M. Kohut (1), A. K. Barker (2), D. Morgan (3), V. R. Troll (2), T. Hansteen (4), A. Klügel (5), J. Majka (2), and M. Manecki (1)

(1) Department of Mineralogy, Petrography and Geochemistry, AGH University of Science and Technology, Kraków, Poland, (2) CEMPEG, Department of Earth Sciences, Uppsala University, Uppsala, Sweden, (3) Faculty of Environment, University of Leeds, Leeds, United Kingdom, (4) IFM-GEOMAR, Kiel, Germany, (5) Department of Earth Sciences, University of Bremen, Bremen, Germany

The dynamics of magma storage and replenishment beneath volcanoes are fundamental for understanding the behaviour of volcanic systems and have direct implications for the future activity of a volcano. The Cape Verde archipelago is located in the Central – Atlantic, west of Senegal and consists of nine ocean islands, multiple islets and eight major seamounts. The Cape Verde submarine plateau was sampled during the Meteor M80/3 research cruise in January 2010. An extensive suite of submarine lavas were collected by dredging (DR) and remotely operated vehicle (ROV).

Detailed petrography and mineral chemistry of the Nola Seamount, located in the northwest of the Cape Verde archipelago is presented with the aim to unravel the pre-eruptive processes, and hence contribute to our understanding of magma ascent and evolution in the Cape Verde.

The sampled volcanics are basanites and ankaramites. All samples comprise a glassy to microcrystalline groundmass that hosts phenocrysts and microphenocrysts of euhedral and subhedral clinopyroxenes, euhedral olivines (Fo_{85}), ilmenite, and kaersutite amphibole (>8.4 wt. % TiO_2)

Clinopyroxene crystals are the dominant phenocryst phase and they exhibit strong zonation with optically distinct cores of variable composition. Clinopyroxenes classify as diopsides to hedenbergites with increasing FeO, TiO_2 and Al_2O_3 and decreasing MgO content from core to rim of the crystals. Moreover, three geochemically different groups of clinopyroxenes can be distinguish; the most primitive with high Mg# $\approx$ 80 – 85% and low Al_2O_3 contents ($\approx$ 4 wt. %), a group with intermediate Mg# $\approx$ 70 – 75% and Al_2O_3 composition ($\approx$ 5 – 7 wt. %), and the most evolved group, with low Mg# $\approx$ 60 – 65% and high Al_2O_3 ($\approx$ 9 – 12 wt.%). The high Al contents of the rims suggest formation during decompression.

Based on high resolution BSE images and geothermobarometry data, diffusional smoothing of Fe – Mg compositional gradients in clinopyroxene crystals is used to model the pre-eruption residence times of crystals at magmatic temperatures. We obtained three timescales: 800 – 1000 years; 250 – 400 years; 10 – 100 years, which correlate with the compositional variations of Mg and Al contents, and thus allow to trace magma ascent in considerable detail.