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A melt inclusion study of hyaloclastite hosted minerals (Hengill, Hekla and Heimaey): origin of the three magmatic series in Iceland

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Basaltic volcanism in Iceland is characterized by three magma series reflecting the tectonic settings. Tholeiites are produced along the rift-zones of the Mid-Atlantic Ridge whereas FeTi-rich transitional basalts characterize propagating ridge segments and leaky transform faults with alkali basalts furthest away from the rift-zones. The different series show distinct compositional variations (tholeiites having high Fe, Ti and low Al, Ca and alkaline concentrations for a given Mg#; transitional lavas are even higher in Fe and Ti but low in Al and intermediate alkalies; alkaline basalts show high alkaline content and relative high Al). The geochemical difference between the three magmatic series is believed to be the product of either variable degree of melting and/or to be related to different magma sources. However, the origin of these basalts remains contentious since the problem of crustal contamination may obliterate geochemical characteristics of all but the most primitive basalts. Therefore, a prerequisite to improve our understanding of the role of mantle melting in generating the three basalt suites, is the identification of their primary melt compositions. One approach to constrain the geochemical compositions of such melts is to study melt inclusions that represent small pockets of trapped melt formed within early-formed crystals isolated from the rest of the magma.

In order to elucidate the parental composition of the three magmatic series, we have thus sampled olivine-bearing hyaloclastites from three volcanic systems in Iceland: Hengill, Hekla and Heimaey representing a tholeiitic a transitional and alkaline mag-

matic series, respectively. The hyaloclastite which were formed in sub-glacial or submarine environments is rapidly quenched basaltic magma that minimizes the risk of melt inclusions crystallization, which is advantageous compared to former melt inclusions in phenocrysts from lava flows. Analytical results from the melt inclusions will be presented at the conference.