Solidification of a rhyolitic magma beneath the Krafla caldera

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A shallow, silica-rich rhyolitic magma body was drilled during the perforation of the Krafla caldera, carried out in the framework of the Iceland Deep Drilling Project (IDDP). Samples of the rhyolitic magma were collected among the cuttings brought to the surface by the drilling fluids. These samples consist of vesiculated glassy fragments containing crystals of titanomagnetite, plagioclase and clinopyroxene. Minerals are in textural and chemical disequilibrium with the rhyolitic melt, as indicated by compositional zoning of plagioclase and exsolution lamellae in clinopyroxene. Additionally, Fe-Mg exchange between clinopyroxene and melt ($^{cpx\text{-}melt}K_D^{Fe\text{-}Mg}$) and Ab-An exchange between plagioclase and melt ($^{plg\text{-}melt}K_D^{Ab\text{-}An}$) show values much lower than those expected at equilibrium conditions. These disequilibrium features make difficult to assess correctly the crystallization path of magma through a classical approach based on the use of geotherbarometers or thermodynamic modelling.

Therefore, in order to elucidate the physico-chemical conditions controlling the final stage of magmatic evolution, we aim to investigate experimentally the origin of the rhyolitic magma, which is still under debate. Indeed, the change of the crystallization conditions recorded by minerals may be addressed either to rapid extraction of the rhyolitic melt from a crystal mush, or to slow cooling of the rhyolitic melt produced *in-situ* by partial melting of the host felsite rock.