Geophysical Research Abstracts, Vol. 8, 07834, 2006
SRef-ID: 1607-7962/gra/EGU06-A-07834

Magnetic properties of basalts from the Stardalur drilling (SW-Iceland) - new insights into a complex cooling and alteration history

C. Vahle (1), A. Kontny (1)

(1) Geol.-Pal. Institut, Ruprecht-Karls-University, INF 234, 69120 Heidelberg, Germany

The Stardalur volcanic complex 20 km NE of Reykjavik (Iceland) forms a localized very strong positive magnetic anomaly of Olduvai age (ca. 1.8 my, normal polarity; Fridleifsson and Kristjánsson 1972). Drillcores from a 200 m deep borehole, drilled in the years 1969-70 into the area of maximum intensity, revealed about 45 m of fresh olivine tholeiitic lava flows and tuffs with low magnetic intensity. Below until at least 140 m strongly magnetic early Quaternary lavas follow. Susceptibility measurements on the drill cores (61.35 m in total length, discontinuously between 34 and 144 m depth) gave high values ranging between 20 and 73 * 10E-03 SI below 44 m. Laboratory measurements on standard cylinders revealed an almost linear correlation between NRM intensity and susceptibility reaching very high values of up to 121 A/m and 148 * 10E-03 SI, respectively, suggesting a high content of opaque minerals. Temperature dependent susceptibility measurements (in argon) give Curie temperatures of ca. 580 °C and microscopic observations (reflected light and SEM) revealed magnetite as the carrier of the magnetic properties. Almost pure ilmenite and sulfide phases (pyrite and chalcopyrite) occur as additional opaque minerals. The magnetite shows different textures (dendritic to euhedral) and grain size populations ($<$ 1 and up to 130 μm), indicating different cooling histories of the rocks. Most of the magnetite is the product of oxy-exsolution of originally titanomagnetite, but also grains formed by hydrothermal alteration are present. Those grains are often associated with large (300 μm) pyrite grains and occur in filled vesicles or along cracks. Additionally, shrinkage cracks and a mottled texture of the grains point to maghemitization. Therefore the unusually high natural remanent magnetization of the Stardalur basalts is not a TRM, but a CRM of different origin, carried by oxidized titanomagnetite (magnetite), secondary magnetite and maghemite.