Geophysical Research Abstracts,
Vol. 11, EGU2009-12337, 2009
EGU General Assembly 2009

The Influence of Cooling Rates on Paleointensity of Volcanic Glasses: an Experimental Approach on Synthetic Glass

F. W. von Aulock (1), A. Ferk (2), R. Leonhardt (2), K.- U. Hess (1), and D. B. Dingwell (1)

(1) Ludwig-Maximilians Universität, Mineralogy, Earth and Environmental Sciences, München, Germany, (2) Montanuniversität Leoben, Geophysics, Austria

The suitability of volcanic glass for paleointensity determinations has been proposed in many studies throughout the last years. Besides the mainly single domain magnetic remanence carriers and the pristine character of the volcanic glass, this was also reasoned by the possibility to correct paleointensity data for cooling rate dependency using relaxation geospeedometry. This method gives the cooling rate of a glass at the glass transition interval which marks the change of a ductile supercooled liquid to a brittle glass. In this study the cooling rate correction as carried out for example by Leonhardt et al. 2006 is tested on synthetic volcanic glass. In order to obtain a stable multicomponent glass with ideal magnetic properties, a natural phonolithic glass from Tenerife (Spain) was melted to avoid heterogeneity and degassing. Further it was tempered for 5 hours at 900 °C to yield a sufficient concentration of magnetic remanence carriers. To exclude nucleation or crystallisation 7 samples were then heated to about 50 °C above the glass transition temperature at around 720 °C and quenched at different rates from 0.1 to 15 K/min. After carrying out a paleointensity experiment using a modified Thellier method, which incorporated alteration, additivity and tail checks, the dependence of the thermoremance on cooling rate was investigated. Using the original cooling rates we corrected the data and obtained paleointensities of around 46 μT, which is a good approximation of the ambient field of 48 μT. Taking into account that the uncorrected mean paleointensity is about 57 μT, this suggests that cooling rate correction is not only working, but also a necessary tool to yield the true field value.

R. Leonhardt , J. Matzka, A.R.L. Nichols , D.B. Dingwell Cooling rate correction of paleointensity determination for volcanic glasses by relaxation geospeedometry; Earth and Planetary Science Letters 243 (2006) 282–292