Recognition of thermal remanent magnetization in rocks and meteorites

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TRM/SIRM acquisition of minerals with minimal shape anisotropy obeys the empirical law (Kletetschka et al., 2004). TRM/SIRM acquisition does not depend significantly on grain size and creates a base for determination whether magnetization of the sample is thermal or isothermal in origin. Such a procedure allows discrimination between the various possible processes responsible for the magnetization of the sample: for example it can separate viscous, isothermal, and thermal components. The technique utilizes a detailed alternating field (AF) demagnetization of the natural remanence, followed by saturating the sample in a large external field and demagnetizing it in the very same AF demagnetization steps. The ratio of the data (AF(NRM)/AF(SIRM)) results in a curve whose slope contains information about the nature of NRM acquisition. The method assumes that the magnetic grains do not change shape when going from small to large size. We apply this method on natural rocks of various origins and lunar rocks. Interestingly, several of lunar samples indicate that their remanence may be thermal in origin, requiring heating to and cooling from temperatures exceeding 1000K.

G. Kletetschka, M. H. Acuna, T. Kohout, P. J. Wasilewski, and J. E. P. Connerney, An Empirical Scaling Law for Acquisition of Thermoremanent Magnetization, Earth and Planetary Science Letters, 226 (3-4), 521-528, 2004.