SYSTEMATIC SURVEY ON THE MAGNETIC SIGNATURE OF MARTIAN METEORITES (SNC): EXTENDING THE DATABASE

V. Hoffmann[1,2], M. Funaki[3], M. Torii[4]. R. Hochleitner[5], N. Classen. [1]Institute for Geosciences, University of Tübingen, [2]Faculty of Geosciences, University of München, Germany, Email: viktor.hoffmann@uni-tuebingen.de; [3]National Institute of Polar Research, Tokyo/Japan; [4]Department of Geosphere-Biosphere System Science, Okayama University of Science, Okayama/Japan, [5] Museum "Reich der Kristalle", München.

Introduction: In recent years, much effort was put in the systematic investigation of the magnetic record of stony meteorites in general, and specifically of SNC [1-4 and references herein]. In this way and together with in situ studies of Martian crustal materials our knowledge about the planetary development of Mars, the potential existence of a strong dynamo field during the first 0.5-1Gy, the petrogenesis of Mars surface as well as the origin of the strong crustal magnetic anomalies was significantly deepened.

Magnetic signature: The focus of our projects is a systematic survey of the magnetic signature / mineralogy, and petrofabric of Martian meteorites in order to shed light on the effects of shock, alteration/weathering (Martian and terrestrial) and consequently on the question in which way the results can be linked to the situation on Mars. The SNC magnetic database was significantly extended, and new original data of most findings of the last years could be included. The SNC magnetic signature shows a striking variability even within specific groups of SNC's. It also has to be noted that in case of the hot-desert stony meteorite findings "magnetic pollution" caused by hand-magnets is a very serious concern. Another important outcome of our projects is that the meaning of earlier paleomagnetic results obtained on SNC rocks should be reinterpreted, especially in terms of magneto-mineralogy and shock effects.

Petrofabric, magnetic anisotropy: The anisotropy of magnetic susceptibility is a measure of the degree of crystalline preferred orientation and shape of the magnetic recorders in a specific rock. AMS is also influenced by contributions from Fe-bearing silicates such as olivines or pyroxenes. The anisotropy ratio P (ratio of maximum/minimum principal MS) generally is quite low in case of the SNC (below P = 1.2-1.3), however it also shows significant scatter even on several chips sampled from the same SNC rock. The results are in disagreement with the high degree of shock known from many SNC meteorites.

Fe-Ni nano phases as a new NRM recorder: Lherzolitic shergottites show quite variable magnetic properties which contrasts with the more homogeneous magnetic signature of other shergottite groups or nakhlites. In the case of lherzolitic shergottites an obvious link between the magnetic signature (magnetic susceptibility (MS), NRM/IRM intensity) and the main mass of the respective Mars rocks was found [5]. Obviously this behavior is an effect of the high shock degree, mineral neoformation (Fe-Ni metal) and terrestrial alteration.

References:

[1] Rochette P., Funaki M., Hoffmann V., et al., Meteor. Planet. Sci., 40 (2005), pp 529-540. [2] Rochette P., Hoffmann V., Funaki M., LPSC XXXVI (2005), 1614. [3] Hoffmann V., Funaki M.: Antarct. Meteor., XXX (2006), pp22-23. [4] Funaki M., Hoffmann V., Torii M.: AGU 2007. [5] Hoffmann V., Torii M., Funaki M.: LPSC 2008.