Geophysical Research Abstracts, Vol. 7, 04738, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04738

Simulation of the Magnetic Properties Experiment on Mars Exploration Rovers

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Among the surprising results from the Magnetic Properties Experiment onboard the Mars Exploration Rovers, is the fact that the dust accumulated on the magnets contains mostly paramagnetic compounds and only limited amount of strongly magnetic phases (1). In order to understand these findings, we have conducted simulation studies using the wind tunnel facilities at the Mars Simulation Laboratory in Århus, Denmark (2) and dust generated from interglacial olivine basalt from Reykjavík Iceland. This olivine basalt is a rather good Mössbauer analogue to the volcanic rocks investigated at Gusev crater, and a valuable analogue for the magnetic anomalies on Mars (3).

The results of the simulation experiments show that the captured dust contains only limited amount of strongly magnetic phases, related partly to the properties of the parent material. In the simulations we find several properties in common with the results from Mars, such as characteristics in optical reflection, Mössbauer spectra and magnetic properties. Simililarities and differences between the results of the simulations and the results from Mars give insight into the processes of dust formation on Mars.

The findings suggest that olivine basalt is indeed the parent material for a major fraction of the dust, formed via erosion, impact gardening and transportation of debris originating from the surface rocks through billions of years in a dry environment. The conclusions that can be derived from these experiments in comparison with data from Mars are supported with particle size determinations, magnetisation measurements and aerodynamic modelling of the capture of magnetic particles by permanent

magnets under Martian conditions.

In view of the findings presented here, methods to extend the use of Mössbauer spectroscopy on Mars by applying surface sensitive techniques (CEMS) will be discussed, and how this method can provide in–depth information on the soil forming processes on Mars.

References:

(1) W. Goetz *et al.*, 2005, submitted to *Nature*.
(2) J. P. Merrison *et al.*, 2002, *J. Geophys. Res.* **107**(E12) 5133.
(3) H. P. Gunnlaugsson *et al.*, 2004, submitted to *Phys. Earth Planet. Int.*