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Characteristics of highly magnetic olivine basalt: Application to Mars

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While the remanent magnetisation of basalt lava containing (oxidised) magnetic phases may be expected to be proportional to the amount of magnetic phases, it has been shown that in natural olivine basalt the remanent magnetization increases at increasing rate with the amount of magnetic phases (1). This is attributed to the oxidation of olivine during cooling of the basalt that leads to the exsolution of magnetite in a single domain state. In this way, olivine basalt is found to become an order of magnitude more magnetic than basalt that does not contain olivine. Based on these findings and Mössbauer spectroscopy data from Gusev Crater on Mars, simple explanations for the magnetic anomalies on Mars and the magnetism of the dust on the surface of Mars are offered.

Here, we present further findings that illustrate how the formation processes of highly magnetic rocks can be identified and characterised in natural olivine basalt. This includes correlations between the amount of different mineral phases (olivine and ilmenite) and their properties with the amount of magnetic phase and its magnetic properties. Methods that could be applied on Mars to distinguish such rocks will be discussed.

References:

(1) H. P. Gunnlaugsson *et al.*, 2004, submitted to *Phys. Earth Planet. Int.*