

Advanced methods of identification of the natural remanent magnetization carriers in meta-basites from Oscar II Land, Western Spitsbergen

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In this study, several rock-magnetic experiments were applied to gain a better understanding of composition and origin of Natural Remanent Magnetization (NRM) carriers in selected meta-dolerites and meta-volcanics of Oscar II Land (Western Spitsbergen). To rise the resolution of results, analyses were conducted on “Fe-containing” separated grains and they were combined with “whole-rock” mineralogical and rock-magnetic observations.

Standard “whole- rock” magnetic studies were performed including: coercivity spectra measurements using Vibrating Sample Magnetometer (VSM), SIRM (saturation isothermal remanent magnetization) measurements, the three component IRM (Isothermal Remanent Magnetisation) procedures (Lowrie 1990). Additionally, the above experiments were supported by examination of the thin sections (optical/SEM/BSE). After that, investigated meta-basites were subjected to separation process during which seven different groups of grains has been distinguished. Six of them revealed shape and parameters of hysteresis loop characteristic for ferromagnetic phases. Separated magnetic phases were again subjected to rock-magnetic (SIRM/Micromag VSM) and mineralogical (optical/SEM/BSE) analyses.

The results point to the presence of low coercivity magnetite/maghemite and pyrrhotite in the meta-dolerites while in the meta-volcanics the occurrence of magnetite/maghemite and hematite was recorded. The results indicated that late to post-Caledonian ferromagnetic minerals are dominant in the studied meta-basites. The investigations also confirmed that Caledonian metamorphic remineralization has completely replaced primary magmatic - Proterozoic/Lower Palaeozoic ferromagnetic carriers in the meta-dolerites.

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