Experimental study of chemical re-magnetization of rocks: implication for LIP of the Karelian Craton dating

A. YU. BYCHKOV,[1] N. V. LUBNINA[1], V. O. OSADCHII[1], N. A. TARASOV[1]

[1]Lomonosov Moscow State University, Leninskie Gory, 1, Moscow, Russia. andrewbychkov@rambler.ru

Palaeomagnetic studies of the Karelian Craton Precambrian complexes the north–north-east down magnetic component (named component 'B') was isolated. This component was formed as a result of chemical re-magnetization under the hydrothermal alteration. The possible age for the rocks to acquire this component of magnetization is indirectly estimated at 1.76–1.79 Ga based on Ar-Ar data. To explain the possibility of the formation of magnetic minerals under the hydrothermal impact, experimental studies were conducted. The experiments were carried out in autoclaves made of titanium alloy with oriented rock samples in a special oven shielded from an external magnetic field with a controlled internal magnetic field. The experiments with duration of 15-30 days were carried out at 300-450 °C and up to 1000 bar using different composition of solutions. Before the experiment, of basalts, gabbros and norites samples from various formations of the Karelian Craton were studied by paleomagnetic methods and were demagnetized. The results showed that single domain magnetite was formed during the hydrothermal transformation. In this case, the magnetization direction corresponds to the internal magnetic field. The most intensity of the magnetite formation was observed in NaCl brines. Thermodynamic calculations were performed using the program HCh [1]. The results confirmed the stability of magnetite during hydrothermal exposure to basalts, gabbros and norites. The source of brines may be the Yatulian evaporites formation (2.1 Ga). Leaching brines occurred on the hydrothermal impact during late thermal events. Thermal events associated with large igneous provinces (LIP) retained the recording of the magnetic direction of the hydrothermal process time. Restoring of component 'B' allows exploring the history of LIP of the Karelian Craton. The study was supported by Russian Science Foundation, grant 18-17-00170.

[1] Shvarov Y. *Appl. Geochem.*, 2015, 55, 17-27.