According to electron microscopy and thermomagnetic analysis, the magnetic mineral of these basalts is titanomagnetite with a magnetite consentration of 44.7% and 50.1% and Curie temperatures Tc=222±5°C and 258±10°C, respectively. The grains of the titanomagnetite of the dendritic structure in the initial state are homogeneous, the composition is close to the stoichiometric, the domain structure according to [Day et al., 1977] corresponds to the pseudo-single-domain state.

Studies of samples annealed at temperatures Tan=290–535°C for 10 hours made it possible to distinguish two processes of transformation of the initial titanomagnetite. The first process was observed at annealing temperatures of 290–410 °C. It was characterized by an increase in the magnetic susceptibility and saturation magnetization by 1.5–1.6 times, an increase by 13–14% of the remanent saturation magnetization and a 10–15 % decrease in the magnetic stiffness, and also the inhomogeneity phase state, which was probably due to the heterogeneity of the oxidation of grains of different sizes.

Annealing of the samples at 350 °C showed that saturation magnetization reached a maximum value after holding for 40.5 hours. With increasing dwell time the contribution to the saturation magnetization of the magnetic phase with a lower Curie temperature decreases. After annealing for t=40.5–110 hours, the thermomagnetic analysis showed the presence of one magnetic phase with Tc=490–510 °C. A distinctive feature of this process of transformation of titanomagnetite is its reversibility: heating of samples in an argon medium up to 600 °C led to homogenization of oxidized titanomagnetite.

It is shown that an increase of the annealing temperature to T=460–535 °C, as well as an increase of annealing time up to 350 hours at T=350 °C, leads to changes in the magnetic properties of titanomagnetite, characteristic of oxy-decomposition. The restoration of the initial state of titanomagnetite after heating the samples to 600 °C in argon was not carried out in this case.

It was found that CRM, measured at room temperature, increases with the annealing time by a law close to exponential, and reaches saturation at t=40 hours. The ratio of the partial thermoremanent magnetization (PTRM) formed in the temperature range from Tc to the annealing temperature decreases from 1.3–1.4 for t=4.5 hours to 0.93 for t=110 hours.

Studies have shown that the properties of CRM and PTRM (Tc–Tan) approach each other with increasing oxidation state. With a high degree of oxidation of titanomagnetite, CRM can be identified as TRM. An indicator that the NRM in basalts in this case is CRM can be a significant decrease in the Curie temperature of the samples after heating them in an argon medium to 600 °C.

In the middle stage of single-phase oxidation, the chemical and PTRM at T>Tan have practically identical spectra of blocking temperatures and differ significantly at T<Tan. Obviously, in this case, CRM and TRM in basalts can be recognized.

DETERMINATION OF PALEOINTENSITY OF GEOMAGNETIC FIELD ON THE VOLCANOES LAVAS OF KAMCHATKA

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Five samples of lavas of volcanoes of Kamchatka were investigated: 3 samples from the Avachinsky volcano and 1 sample from the Gorely volcano - no more than 8000 years old, 1 - from the lava flow of the Tolbachik volcano eruption in 2012.

Thermomagnetic analysis carried out on the dependence of the magnetization in the field of 0.24T and the initial magnetic susceptibility on temperature showed that the titaniferous magnetite with the Curie temperature Tc=540÷580°C is the mineral responsible for the magnetic properties of the Avachinsky volcano samples. The investigation of the grains of ore minerals in electron and magnetic-force microscopes revealed the presence of signs of high-temperature oxidation of titanomagnetite. The Curie temperature of the samples from Gorely and Tolbachik volcanoes was Tc=250-310°C.

The paleointensity value Hdr=56μT, determined from the NRM of sample from the Tolbachik volcano using the Telier-Coe procedures, was quite close to the value of the modern magnetic field in the region of this volcano (H_{IGRF}=53μT) according to the IGRF-12 model. It demonstrates the reliability of the methodology we used to determine the paleointensity from the remanent magnetization of igneous rocks. Age of the lava flow from the volcano Avachinsky was not known. The paleointensity values Hdr=50±4, 55±4, 58±6, determined from the samples from this volcano, were also quite close to the current value of H_{IGRF} =52μT for the location of this volcano. It is concluded that the age of the investigated lava flow does not exceed 200 years.

For the sample from the Gorely volcano, the value Hdr=69±6μT and the calculated value of VADM=10±0.9*10^{22}A*m^2 indicate that the investigated rock refers to the outpouring of lava that occurred 3-4 thousand years ago, which is in good agreement with the literature data on paleosecular variations of the geomagnetic field.

The sample from Tolbachik volcano was not oriented. Investigating two samples from the Avachinsky volcano we managed to obtain quite close values of the coordinates of the paleomagnetic pole 67N 142E and 77N 133E. The limited data obtained did not allow to make a more unambiguous conclusion about the coordinates of the paleomagnetic pole. The measured values of declination and inclination of the remanent magnetization of one of the Avachinsky volcano samples indicate that the NRM was formed when the lava flow moved.

INTERRELATIONS BETWEEN THE GRANULOMETRIC COMPOSITION, MAGNETIC PROPERTIES AND GEOCHEMICAL INDICATORS IN THE SUBAERIAL DEPOSITS OF THE ARCHAEOLOGICAL SITE "TUYANA" (TUNKA DEPRESSION, BAIKAL REGION, RUSSIA)

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The Tuyana section (51º42'N, 102º41'E) is located at foothills of Khamar Daban ridge, on the right bank of the Irkut river. A unique multi-layer archaeological site of the Upper Paleolithic age was discovered here in 2011. We present the analysis of correlation between granulometric composition, content of oxides of various elements, geochemical indicators of climate and rock-magnetic characteristics.

The granulometric, chemical composition and rock-magnetic properties of sedimentary rocks are influenced by the same factors: the chemical composition and genesis of rocks in the source, the type and