

Thellier's experiments on artificial ceramics to determine the magnitude of the magnetic field

Olga V. Pilipenko¹ , Gennady P. Markov¹ , Yuri B. Tsetlin² , Natalya A. Aphinogenova³

¹ Schmidt Institute of Physics of the Earth RAS , Russia

² Institute of Archeology RAS

³ Geophysical Observatory "Borok", branch of the Schmidt Institute of Physics of the Earth RAS

pilipenko@ifz.ru

When determining the value of the archaeointensity of the Earth's magnetic field using the Thellier method, which took place in ancient times during the firing of ceramics, it is assumed that it was equal to the modern value. The process of making and firing ceramics is relatively short-term and can fit within a short period of magnetic disturbances, when the value of the Earth's magnetic field differed from the modern value, for example, by a factor of two. Then the question arises: how will this affect the results of experiments to determine archaeointensity using the Thellier method. To bring the experiments as close as possible to natural conditions, fragments of two clay vessels made using technology common in the Neolithic Age in middle zone of Central Russia were chosen as the object of study. Petromagnetic and X-ray diffraction studies were carried out on these samples in order to study the ferrimagnetic composition of the ceramics. Next, duplicate samples were heated to 600°C, and thermoremanent magnetization was created on them in a constant magnetic field: 20, 50 and 100 μT . These samples were then subjected to Thellier-Coe analysis in order to study the dependence of the formation of thermoremanent magnetization during the cooling of ceramics in laboratory magnetic fields of various strengths. Thus, in this methodological work, the authors tried to recreate as much as possible the conditions for the emergence of the "archaeomagnetic" record with a known value of the laboratory magnetic field and artificial ceramics with a known ferrimagnetic composition like in the Neolithic one. Archaeomagnetic and rockmagnetic studies were carried out at the Center of Shared Research. Facilities "Petrophysics, Geomechanics and Paleomagnetism" of the Schmidt Institute of Physics of the Earth RAS with the financial support of the State assignment No. FMWU-2022-0005 IPE RAS and No.FMWU-2022-0026 IPE RAS.