MAGNETIC CHARACTERIZATION OF SPHERICALLY SHOCKED SAMPLES OF THE IRON METEORITE CHINGA.

N. S. Bezaeva[1,2], D. D. Badyukov[3], E. A. Kozlov[4] and J. M. Feinberg[5,6]. [1]Faculty of Physics, M.V. Lomonosov Moscow State University, Leninskie Gory, Moscow, 119991, Russia. E-mail: bezaeva@physics.msu.ru. [2]Ural Federal University, 19 Mira Str., Ekaterinburg, 620002, Russia. [3]Vernadsky Institute of Geochemistry and Analytical Chemistry, Russian Academy of Sciences, 19 Kosygin Str., Moscow, 119991, Russia. [4]Russian Federal Nuclear Center, All-Russian Research Institute for Technical Physics, Snezhinsk, 454070, Chelyabinsk Region, Russia. [5]Institute for Rock Magnetism, University of Minnesota, 310 Pillsbury Drive SE, Minneapolis, MN 55455, United States. [6] Department of Earth Sciences, University of Minnesota, 310 Pillsbury Drive SE, Minneapolis, MN 55455, United States.

Introduction: Hypervelocity impacts are an important mechanism for the evolution of the solid matter in our solar system. Shock waves generated during impacts can modify both the intrinsic magnetic properties and remanent magnetization of extraterrestrial materials. We conducted spherical shock-recovery experiments on the Chinga iron meteorite (find, IVB Ni-rich ataxite, anomalous [1]). Preliminary pressure (p) and temperature (T) profiles $p(R, t)$ and $T(R, t)$ along the radius R of spherical Chinga sample (initially 56.01 mm in diameter), where t is time, can be found in [2]. Structural changes in spherically shocked Chinga sample were previously reported in [3]. Here we present full magnetic characterization of Chinga after the same explosive loading. The samples in this study were extracted from the meridional plane of the shocked spherical sample along a radial transect and had cubic form.

Results: Hysteresis loops and back-field demagnetization remanence curves acquired in the 10 to 300 K temperature range showed that all samples are magnetically soft with $B_c \in [0.4; 0.9]$ mT and $B_{cr} \in [28; 64]$ mT, where B_c and B_{cr} are coercivity and coercivity of remanence, respectively. All samples are dominated by typical multidomain (MD) behaviour.

Thermomagnetic curves of saturation magnetization M_s versus temperature up to 750°C confirmed the presence of Ni-poor kamacite and tetrataenite. Alternating field (AF) demagnetization of saturation isothermal remanent magnetization (SIRM) of unshocked and spherically shocked Chinga samples showed that shocked samples are less resistant to AF demagnetization and are characterized by lower median destructive field (MDF_i) values.

Spherical loading also resulted in the shift of shocked samples to the right on the Day plot (B_{cr}/B_c vs. M_{rs}/M_s where M_{rs} is saturation remanent magnetization), i.e., towards more MD-like behaviour. Changes in low-field magnetic susceptibility and magnetic hardness (B_{cr}) of shocked samples along R do not seem to have any clear trend. They will be discussed further together with interpretation of natural remanent magnetization (NRM) records and EBSD results.

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