MAGNETIC PROPERTIES AND PETROGRAPHY OF URENGOITES AND SOUTH-URAL GLASS.

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Introduction: Urengoites and South-Ural glass are 'tektite-like' objects from Western Siberia (Russia), previously described in [1-3]. These impact melt glasses were produced during impact cratering events and ejected from the source craters. The source craters of urengoites and the South-Ural glass are different but remain unknown. Urengoites (~24 Ma [1]) were discovered near the West-Siberian town of Novy Urengoi (66°07′N, 76°57′E) on two places separated by 40 km [1-2]. Only three natural pieces of bottle-green and pale green natural glasses are known: U-1, U-2 and U-3. Total recovered mass was ~21.65 g. The only recovered South-Ural glass A-1 (~6.2 Ma [1]) was found near Magnitogorsk (53°37′N, 60°10′E) and was in form of a light-green rounded glass piece (~90 g) [3]. In spite of previous works [1-3], the magnetic properties of urengoites and South-Ural glass remain unknown. Indeed, the authors of [2] made an attempt to measure natural remanent magnetization (NRM) of those glasses and reported that NRM "in all samples are absent, magnetic susceptibility is rather low (~25-40 × 10^{-6} SI)". Here we present a comprehensive magnetic characterization for all three currently known urengoite specimens and the only discovered South-Ural glass, as well as a revisit of their petrography based on thin sections.

Methods: Magnetic measurements were performed using 2G Enterprises SQUID magnetometer (NRM, saturation remanent magnetization (SIRM), acquired in a 1T magnetic field, and their demagnetization curves), kappabridge MFK1-FA (AGICO) (low-field magnetic susceptibility χ_0 at room temperature, its field and frequency dependences), MPMS 3 (Quantum Design) and LakeShore Cryotronics 7410 vibrating sample magnetometer for low-temperature (LT) magnetometry and acquisition of hysteresis loops and backfield remanence demagnetization curves. All used methods are non-destructive.

Results: Main rock magnetic properties of investigated samples are presented in Table. Contrary to previous investigations [2], we could measure NRM for all samples and acquire alternating field demagnetization spectra for the biggest samples (U-1 and A-1, see MDF values in Table).

Table. Main rock magnetic properties of urengoites and South-Ural glass at room temperature.

Sample ID	mass (g)	χ_0 (10^{-9} m^3/kg)	FeO (wt.%)$^+$	NRM (μAm^2/kg)	MDF (mT)	SIRM (μAm^2/kg)	S_{300}	B_{cr} (mT)
U-1	8.5597	19.20	1.03	0.0282	6	4.33	0.96	-
U-2	0.2313	9.98	0.32	0.216	-	13.20	0.90	69.0
U-3	0.1478	19.90	0.54	0.310	-	62.40	0.85	68.5
A-1	3.7396	4.66	0.43	0.145	<2	9.36	1	-

$^+$data from [1]; MDF is median destructive field of NRM; S_{300} is S-ratio = $|IRM_{-300\ mT}|/SIRM_{1T}$; for other designations see text.

The obtained χ_0 values for all four samples are close to those for Libyan glassed (see Table 1 in [4]). Anisotropy of magnetic susceptibility (AMS) measurements for A-1 sample revealed 28% of anisotropy. SIRM values and non-isotropic susceptibility demonstrate a composite ferromagnetic and paramagnetic origin of susceptibility. U-1 and A-1 do not demonstrate any field dependence of χ_0, while a non-negligible frequency dependence of χ_0 likely indicates the presence of superparamagnetic grains of nanometric size. Additional LT results will be presented at the Meeting.

The urengoite samples under microscope show fluidal texture with shlieren of lechatelierite and birefringent bands, some small vesicles are present. The South-Ural glass is homogeneous in texture, but also contents vesicles. All samples have very low content of H_2O and highly reduced Fe.

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