STUCTURE ANISOTROPY OF ORDINARY CHONDRITES.

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Introduction: As a result of experimental studies, the strong anisotropy of physical and mechanical properties was found in the most widespread type of stony meteorites-ordinary chondrites, when in one of the three directions the compressive strength limit exceeds by 60% the values in the other two directions [1]. Similar anisotropy in terrestrial rocks is usually due to the ordered orientation of grains and crystals of one or several major minerals in sedimentary rocks or in magmatic rocks with flow structure. Probably, such an ordered structure in stony meteorites and asteroids could have formed during the segregation and consolidation of the primary substance under the conditions of a highly asymmetric physical medium in a protoplanetary cloud (a strong magnetic field?). The study of the nature of anisotropy will allow us to evaluate the physical conditions in the protoplanetary cloud that existed at the earliest stage of the formation of the solar system.

Results: The observed structural anisotropy in ordinary chondrites is approximated by an elongated ellipsoid with the ratio of the main semiaxes a:(b = c) = 1.6:1 (Fig. 1). The measured compressive strength of ordinary chondrites taking into account the average values in three directions is in the range from 91 to 262 MPa (Table 1). The tensile strength is also in the range from 17 to 34 MPa, taking into account the values for individual directions. It should be noted that the measured tensile strength is the upper limit value limiting the maximum destructive aerodynamic load for stone meteoroids [2].

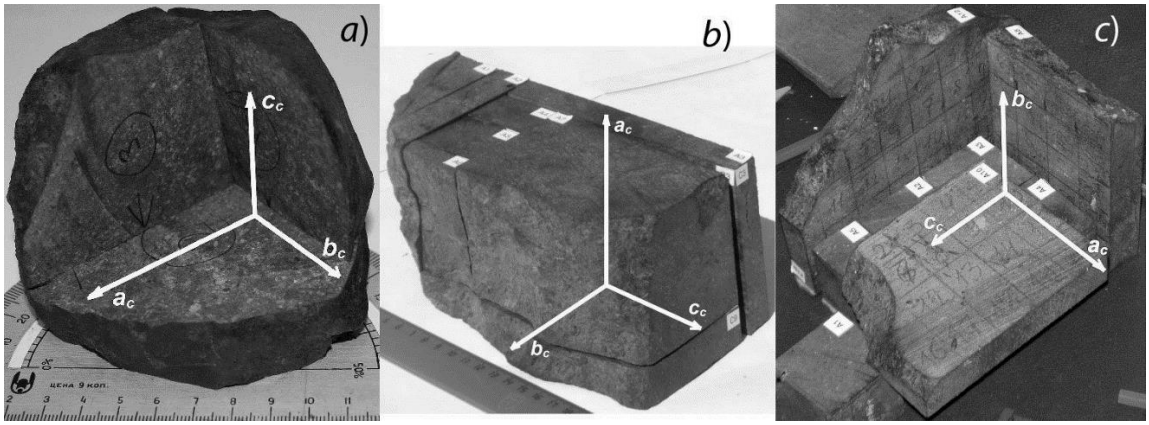

Fig. 1. Orientation of the ellipsoid of anisotropy of physicomechanical properties with semiaxes of $a_c > b_c \geq c_c$ in fragments of meteorites: a) meteorite SAUH 001; b) meteorite Tsarev, fragment number 1539; (c) Meteorite Tsarev, fragment No. 15384.1.

Table 1. Three-dimensional distribution of physical and mechanical properties in ordinary chondrites.

Name	Axis of an anisotropy ellipsoid			Average for sample
	a_c	b_c	c_c	
Meteorite SAUH 001 (a_c/c_c=**1.6**)				
Compressive strength, MPa	**143**	**94**	**91**	**105**
Number of measurements	6	7	10	23
Variation coef., %	20	29	23	31
Tensile strength, MPa	**18**	**17**	**18**	**18**
Number of measurements	13	13	14	40
Variation coef., %	28	26	27	27
Meteorite Tsarev, fragment №15390,9 (a_c/c_c=**1.6**)				
Compressive strength, МПа	**262**	**168**	**160**	**203**
Number of measurements	25	27	13	65
Variation coef., %	19	37	29	35
Tensile strength, МПа	**28**	**34**	**27**	**29**
Number of measurements	23	20	33	76
Variation coef., %	32	35	31	34

References: [1] Slyuta E.N. et. al. (2009) *LPS XXXX*, Abstract #1051. [2] Slyuta E.N. (2017) *Solar System Research 51:64–85*.