HIGHLY POROUS FRAGMENTS IN SARATOV (L4) ORDINARY CHONDRITE.

Three highly porous friable fragments have been found in two polished sections (2.14cm²) of Saratov chondrite. Their approximate sizes (mm) are 4.3x2.9, 1.3x1.1, and 0.5x0.4. From area measurements on photomicrographs, we estimate a porosity of 65vol.% for their silicate aggregates and calculate a density of 1.1g/cm³. The porosity of the chondrite Saratov is known to be 18.2 vol.% [1]. The largest fragment, containing chondrules, has been studied by optical microscope, SEM and electron microprobe.

Highly porous fragments consist of an aggregate of fine rounded and anhedral silicate grains (<0.5-10.0)µm, that are linked together, making a honeycomb construction. Some anhedral grains have larger sizes (up to 70µm) and globular structure. The small sizes of the globules (<1µm) make it difficult to observe the silicate aggregate surface and analyse the mineral composition. Microprobe data show that the smaller grains are monomineral and consist of olivine (Fa22.9-23.8), low- and highcalcium pyroxenes (En82.2Fs17.8Wo0.5, and En82.4Fs15.9Wo31.7, respectively), labradorite (Ab43.2An56.2Or0.5); the large ones are polymineral and consist of olivine and/or pyroxene with oligoclase or labradorite.

Some metal and single troilite grains are present in the highly porous fragments. The nickel-iron content is less than 1vol.% (in the bulk meteorite - 4.3vol.%). The sizes of the metal and troilite particles are usually less than 5µm, but in some cases, kamacite and taenite grains have up to 80µm. Kamacite is characterized by composition variations from grain to grain and taenite by homogeneous (32.5 mass% Ni), or slightly zoned (30.9-35.8 mass% Ni) composition.

Some relict porphyritic chondrules and chondrule splints are present in the largest highly porous fragment, consisting of olivine (Fa22.9-24.4), pyroxene (En78.5-88.1Fs15.5-20.7Wo3-4.8) and small quantity of plagioclase (Ab27.5-39.4An71.9-90.6Or0-6). One of the chondrule splints contains enstatite (En91.1Fs8.4Wo0.5).

Compared to chondrules [2,3] and matrix in the main part of the meteorite, the highly porous fragment has the same olivine and high-calcium pyroxene composition but differs by a lower concentration of CaO (0.17-0.40; in meteorite: 0.80-2.13 mass%) in low-calcium pyroxene, lower concentration of Ni (3.84-5.76; in meteorite: 5.31-6.55 mass%) in kamacite and higher variation of the kamacite composition.

Evidences of shock metamorphism are present both in highly porous fragments and in main part of the chondrite. Comparison of these data with experimental ones [4] indicates two collisions with different shock pressure (≥30GPa, <500°C and ≥8GPa) in cosmic history of the chondrite Saratov.

CONCLUSION. 1. Lithic fragments are present in Saratov meteorite, that are characterized by a high porosity, a low density, a globular structure of the silicate grains, small sizes for most grains, low metal- and troilite-content, and composition of plagioclase, low-calcium pyroxene and kamacite different from that of the meteorite. 2. The composition resemblance between the silicate aggregate and chondrules in the largest fragment allows to suppose their genetic relationship. The highly porous fragments appear to be a separate petrographic component with another origin than the main part of the meteorite. 3. The
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Porosity, density, mineralogy and structure of the fragments are most similar to those of the anhydrous-silicate particles of interplanetary dust [5], and, to a lesser extent, to the lunar breccias and agglutinates [6]. This allows to infer a similar mechanism of agglomeration from fine mineral dust by means of electrostatic sticking [7], followed by formation of friable aggregates. 4. The highly porous fragments were buried and preserved during agglomeration of the chondrite matter. Their survival inside the parent body testifies to the formation of the unequilibrated chondrites on the surface of, or at small depth in the parent body. Shock metamorphism later induced partial structural and composition transformation in the whole meteorite. 5. The presence of these unique highly porous fragments in Saratov chondrite can be important evidence of: a) regolith formation on the surface of the meteorite parent body [8,9] and/or b) existence of friable bodies in space [10]. These bodies cannot penetrate the atmosphere of the Earth. The famous Tunguska phenomenon could be connected with such cosmic matter.