IMPACT INDUCED MATTER TRANSFORMATION: EXPERIMENTS
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The meteorites, the moon matter and the matter from the meteoritical craters content the information about impact events. The maximum value of the local impact stress, attained by investigation of meteorites, is 120-140 Gpa (1.2). The impact deformation scale was determined from model experiments on various minerals (3.4). Our experiments on the action of shock wave by the amplitude 100 Gpa were carried out in the special device for axial symmetry compression. The duration of the high pressure impulse was \( \sim 7 \) \( \mu \)m. Three types of samples consisted of two equal volume parts were shocked. The first part (in the shock wave direction) of the every sample was the 0.1 mm chip of the Sichote Alin meteorite. The second part was the olivine powder with the 1 mm particle sizes (sample I), the anorthite one with the 0.5-0.6 mm particle sizes (sample II), the granite one with the 20 \( \mu \)m or less particle sizes (sample III). After shock-loading the samples were studied microscopically and by electron microprobe.

The shock loading caused the strong mixing of the two parts in each sample. Both metal and silicate phases were mostly meeted, but the small crystal zones retained in glass. The various melting structure were observed: the metal and silicate spherules and the spherules similar to the meteorite chondrules. Sample I—metal+olivine. The metal phase consists of the nesbe crystals with fine-grained structure. But near silicate spherules the metal phase areas have coarse-grained structure. The chemical composition of the metal spherules is homogeneous and differs from that of the initial metal. The Ni/Co ratio value decreases from 12.3 (initial) to 9.4 (shock melt) and 7.8 (metal spherules). The structure and morphology of the silicate glass particles are similar to the lunar and meteorite ones. The chemical composition of the silicate phase for shocked matter is changed as compared with initial substance. The contents of FeO, SiO\(_2\), MgO(\%) are equal to 19.3; 40.1; 39.5 for initial olivine 24.4; 58.8; 15.2 for the shock melt 18.6; 58.9; 14.2 for the spherules with 0.10-0.25 mm sizes 13.1-58.5; 25.2-65.5; 4.1-15.5 for the spherules with 0.01-0.015 mm sizes. The strong loss of MgO is observed in the shocked melt. In it two groups of spherules is discovered with homogeneous and heterogeneous compositions. There are three chondrules with the rough surfaces. The small chondrule (70 \( \mu \)m) consists of the fine olivine crystals. The two others (170 and 250 \( \mu \)m) contain both olivine crystals and glass. Sample II—metal + anorthite. The metal phase has simple polycrystalline structure and the unchanged chemical composition. The anorthite spherules have various surface reliefs. The che-
mical composition of the most of the them is the same as that of the moon chondrules from regolithes "Luna-16" and "Luna-20".

The contents of SiO$_2$, FeO, Al$_2$O$_3$, MgO, CaO are equal to 53.4; 0.6; 20.6-30.9; 0.15; 16.6-18.1 for initial anorthite 43.8; 8.9; 31.4; 0.3; 14.6 for experimental spherules 43.6; 0.0; 36.1; 0.4; 19.3 for the moon spherules (5).

The shock formed anorthite spherules have the homogeneous compositions. There were found the silica spherules so suggesting the partial decomposition of the anorthite caused by shock loading. Sample III - metal + granite. The structure is similar to that of the matter from meteorite craters. Because of the more complex mineral composition in this experiment various particles appear to arise with different form, colour and structure. The metal spherules are white, black and blue colour. The glass particles have needle, sheat and other forms. The black metall spherules have following composition: Fe-72.25%, Ni-0.34%, Co-0.13%. It is magnetic spherules. An insignificant loss of SiO$_2$ and rather strong loss of Al$_2$O$_3$: Na$_2$O and K$_2$O is observed for silicate melt. The loss degrees of Na$_2$O, and K$_2$O correspond to the initial analytes. The chemical composition of the initial matter and of the shock melt is (%): SiO$_2$-73.36; 65.9 Al$_2$O$_3$-13.84; 1.71-7.54 Na$_2$O-5.46; 0.33 K$_2$O-4.14; 1.33 respectively.

As followed from these experiments the olivine and anorthite glasses with the great variety of melting structures have been formed at high pressures. In the shock melts the loss both of the volatily component (Na$_2$O, K$_2$O) and the elements, forming difficut volatile oxides (Mg, Al) are observed. The energy of shock compression appears to exceed the energy needed for the oxygen estrangement in extremal conditions. The fractionation of the chemical elements is defined by their own volatilies.