CHONDRULE-LIKE PARTICLES FROM "LUNA-16" AND "LUNA-20" REGOLITH SAMPLES. A.V.Ivanov, M.A.Nazarov, O.D.Rode, I.D.Shevaleevsky. V.I.Vernadsky Institute of Geochemistry and Analytical Chemistry, USSR Academy of Sciences, Moscow, USSR.

Spherical particles with the texture resembling the meteoritic chondrules are characteristic of the lunar regolith. The origin of such chondrule-like particles (chondroids) is usually considered in connection with processes of rock melting under impact phenomena on the lunar surface /1-5/. In contrast of glass spherules the texture of chondroids may genetically be interpreted with respect to the intensity and the character of the impact cloud evolution. Therefore the investigation of chondroids is of great interest for the understanding of the role of impact processes in the geology of the Moon.

The texture and the chemical composition of chondrule-like particles from "Luna-16" and "Luna-20" regolith samples have been studied. The obtained data allow to subdivide them into three main types forming as a result of: 1) spontaneous crystallization of completely molten drops; 2) crystallization of solid glass spherules; 3) solidification of partly molten drops including components of the regolith fines.

The textures of the first type chondrules noticeably differ depending on the crystallization degree. Best crystallized species are represented by chondroids with intersertal texture. They consist of lath-like plagioclase crystals and interstitial residue magnesian-ferrous glass. The chondroids with a sheaf-like texture have a lower degree of phase individualization of the material. They are composed of sheaf-like aggregates mainly consisting of plagioclase and pyroxene subindividuals with minor quantities of interstitial glass. Spherulite-like textures are characteristic features of chondroids formed due to the crystallization of glass spherules. These chondroids are characterized with following peculiarities the moderate degree of crystallization observed connection of the morphology of crystalline aggregates with fragile deformations of the chondroid surface, the constant chemical composition in all points irrespective to the degree of crystallization and the general smoothness of the external surface. The two last features essentially are found to inherit the typical features of the lunar glass spherules.

The chondroids of the third type have a brecciated texture due to the presence of relatively large fragments of rocks and minerals (mainly of plagioclase and pyroxene) which occur in the poorly crystallized matrix. Only the peculiar spherical shape of these particles allows to distinguish them from the fragments of lunar breccias.

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The type of chondroids depends on the impact energy in the point of chondroid formation in the ejected cloud and on the composition of the initial material.

The formation of well crystallized chondroids with intersertal texture is suggested to occur in the central part of the ejected cloud in the conditions of slower cooling. Besides in the central parts of the cloud the probability of forced crystallization increases, because of increased density of matter. The chondroids of the sheaf-like type should crystallize in the peripheric parts of the cloud, where the cooling rate is considerably higher and a higher supercooling degree may be reached. In accordance with these factors one can suppose the formation of glass spherules in the external parts of the cloud under an extremely rapid cooling. A following crystallization of the spherules could take place in the heated impact deposits. Chondroids of the brecciated type genetically bound with partial melting arise in the peripheric zones of the impact where the temperature is not sufficient for the complete melting of the material.

All chondroids formed as a result of material melting correspond in chemical and normative composition to the rocks of ANT suite. It is probably a result of high crystallization ability of the particular melts /5/. The drops of the mare basaltic composition melt do not possess such features and are solidified as a glass spherules. Therefore the chondroids observed in the "Luna-16" mare regolith are probably of a highland origin. The very low content of chondrule-like particles in the "Luna-16" sample is in agreement with this while in the "Luna-20" sample chondroids comprise about 30% of all spherical particles.

It is important to note that the composition of forming chondroids commonly does not correspond to the composition of the initial material. Thus some of the chondroids have extremely low SiO_2 content and therefore have no analogues among the lunar rocks. As it has been shown earlier /6/ it is very difficult to explain this anomaly by the crystallization differentiation, but it conforms well with the conception of the fractional evaporation of silica (and some of other components (first of all alkalies and iron) during the formation of the chondroids in the ejected cloud. On the other hand the enrichment of some volatile components observed in the marginal zone of a number of chondroids is the result of condensation of the impact cloud material on the surface of the cooling particles.

In general one should assume the higher probability of the production of the chondroids and especially of the chondroids with unintersertal texture forming under the crystallization of

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molten drops in accordance with the increase of the energy of the impact event. The probability of formation of volatile depleted chondroids is assumed to increase in the considered situation. This deficiency is due by the fractional evaporation of the volatile elements at the high temperatures. In the case of more weak impacts there is greater possibility that only glass spherules and chondroids of the brecciated type should be formed.

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