PETROLOGICAL PECULIARITIES OF BASALTIC ROCKS FROM MARE CRISIUM.

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Based on petrochemical analysis of basaltic magmatic rocks from Luna 24 sample three groups of rocks are distinguished. All three are found to represent a new type of basic rocks enriched in iron and depleted in titanium (1,2,3,4,5,6):1) Olivine gabbro and vitrophyric basalts with high magnesium content and relatively low alumina content; 2) basalts, dolerites and hypothetical pyroclastics ("black glasses") with moderate alumina content and depleted in magnesium; 3) gabbro, cristobalitic gabbro, cristobalitic basalts (up to leucocratic species) with high alumina content (13-19%) and low magnesium content.

As it was reported earlier (5,6,7) the lunar basaltic rocks including the rocks from Apollo 11,12,15,17 plotted on Zavaritsky petrochemical diagram are found to follow the specific lunar basaltic succession (Fig.1). At the same time it was indicated that the basalts from Luna 16 do not belong to this trend representing the separate branch. Kurat et al./8/ also emphasized the relatively high alumina content in these rocks. Note that the trend representing the high-alumina nonmare basalts of Luna 20 plotted by us according to the data of Conrad et al./9/ is in an isolated position and in terms of An-Fo-SiO_2 phase diagram is located in the vicinity of the Px-An joint and simultaneously near the Ol-An cotectic line. It is assumed that the abyssal differentiation with the alumina concentration in the melt would result in the generation of high alumina rock series.

The petrochemical peculiarities of rocks from Luna 24 lead to the preliminar conclusion: the Luna 24 rocks could represent the transition from mare type of rock series (group I) via group 2,3 to the high alumina nonmare basalts similar to highland basalts of Luna 20 (Fig.1). Such type of petrochemical evolution could serve as a hypothetical mechanism of generation of melts similar to certain types of highland rocks. Such approach is useful in representation of the highland rocks as a result of regular evolution of lunar matter. The petrological peculiarities of each distinguished group of rocks from Luna 24 are reflected in peculiarities of chemical composition of rockforming minerals e,g. pyroxenes. Olivine gabbro (group I) are characterized with mostly magnesian members of pyroxenes with variations from augites up to low-calcium pigeonites being observed in zonal crystals as well in total composition of separate grains. Some samples (e.g. 1642,1519, Fig.2a) are representing only a part of pyroxene composition trend similar to one reported by Kurat et al./10/ in several basaltic rocks from Luna 16. This

type of compositional trend is assumed to represent the abyssal crystallization of melanocratic olivine rocks where the pyroxene forms after the crystallization of high-magnesian olivine and low-titanium chromite. At the same time the melanocratic gabbro (No1719) represents the similar trend prolonged to the field of high-ferruginous augites (Fig.2a). The latter affinity is interpreted as the indication of the long period of crystallization. Hence the olivine gabbro are distinguished as the separate petrochemical type of rocks with presumable abyssal origin of their melts. Anchieutectic microgabbro as well as dolerites (group 2) are characterized with pyroxenes their compositions being near to the field of ferruginous subcalcic augites (Fig.2b). Narrow compositional interval of these pyroxenes is assumed to display the relative fast and simultaneous crystallization of such rocks. The absence of early crystallization mineral phases as in the rocks of group 1 supports the idea of independent petrological role of microgabbro and the existence of the gap in the petrological evolution between these groups. The group 3 is represented with cristobalitic gabbro and basalts. The chemical compositions of pyroxenes from these rocks are indicating the total tendency of lower temperature crystallization. While the iron content in the melt is lower. The compositional trends of the pyroxenes (Fig.2c) show the relative high FeO/(FeO+MgO) and their variations are identified in the limited interval from ferruginous subcalcic augites up to high-calcic ferruginous pyroxenes. Such type of trend is interpreted as the transitional from pyroxenes of dolerites to pyroxenes of cristobalitic rocks. Another crystallization path could be assumed basing on the cristobalitic gabbro No1581 (Fig.2d). This crystallization path is characterized by the features of nonequilibrium crystallization ~~be~~ both on the initial and final stages with the formation of tridymite-fayalitic-ferrohedenbergitic-eutectic. Thus the mineralogical evidence are supporting the concept of the independent petrological position of olivine gabbro in relation to cristobalitic gabbro and basalts. The latter are characterized with high alumina and iron content. The petrochemical and mineralogical analysis of the lunar rocks from Luna 24 leads to the following conclusions: a) the rocks are the representatives of the lunar mare basalt family with several special features; b) two genetical groups of rocks are distinguished; c) the rocks of group 1 are assumed to have the most abyssal origin.

Captions to figures

Fig.1 The chemical composition of lunar basalts as plotted on Zavaritsky petrochemical diagram. 1- group 1, Luna 24; 2- group 2, Luna 24; 3- group 3, Luna 24; 4- basalts, Luna 16; 5- high-alumina basalts, Luna 20; 6- basaltic field based on data of Apollo 11,12,15,17; 7- mare

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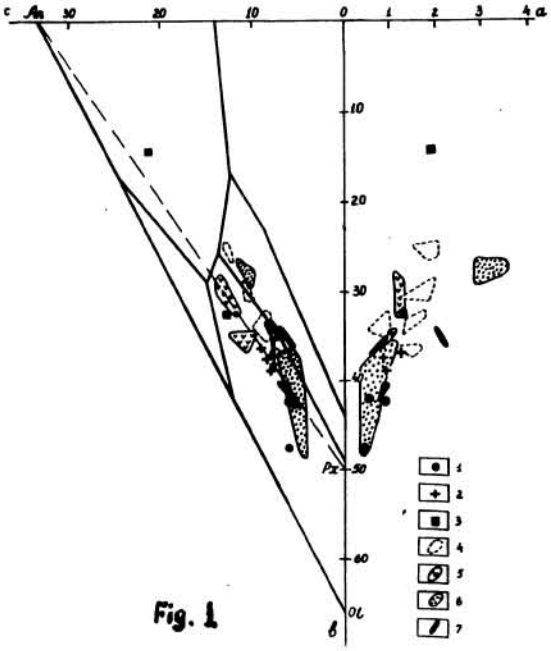
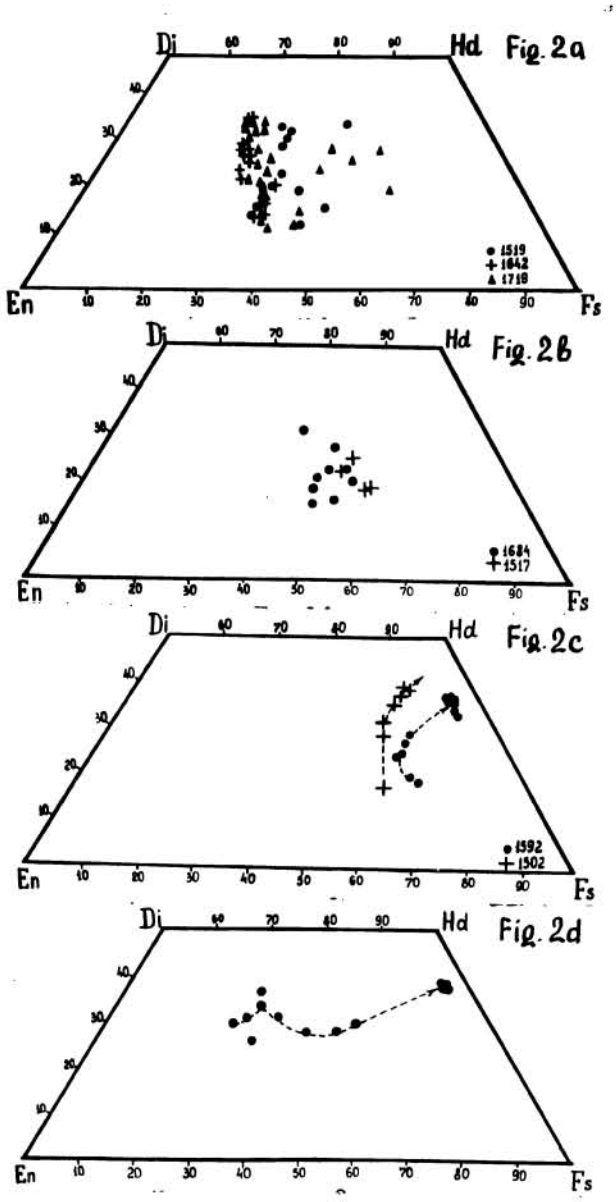


Fig. 1



basalts, Luna 20.
Fig.2 Compositional trends of lunar rocks from Luna 24.
a)olivine gabbro No1642; melanocratic gabbro No1719; b) dolerites and microgabbro No 1684,1517; c)cristobalitic gabbro No1502, 1592; d)cristobalitic gabbro No1581.

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