VERTICAL CHEMICAL DIFFERENTIATION OF MASSIVE IMPACTITES, FORMING THICK SHEETS IN TERRESTRIAL IMPACT CRATERS.

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A chemical composition of massive impactites (tagamites)in thick sheets in terrestrial impact craters is determined by a composition of target rocks,which experience impact melting,by a mixing of melt fractions heated to different temperatures when they are ejected from a transient crater, trapping of unmelted rock and mineral fragments and their partial engulfing, It is assumed that a composition of tagamites is, to a certain extent, influenced by selective evaporation and condensation processes (1,2,3,4 etc.).

Apart from these processes, a redistribution of petrogenic components in a vertical section of a melt lens in the process of its cooling ang crystallization can also be of certain significance. As one of the examples, composition variations of tagamites from the Boltysh astrobleme might be regarded; its body has a shape of a ring lens (5,6). Alternated in its vertical section, about 200 m thick, are tagamites generated due to cooling and crystallization of high - and relatively low-temperature melt fractions,not differeng greatly by their chemical composition. Much greater composition differences are observed moving from a base to a top of a tagamite body, studied from borehole core. Slightly decreasing in ascending order, a contents of TiO_2 and CaO (~15 per cent), P_2O_5 (~30 per cent);the same weak tendency is displayed by MgO (~10 per cent), as well as Al_2O_3 and Na_2O. A total iron content (in term of FeO) increases in ascending order (~15 per cent); Fe_2O_3:FeO ratio increases about 10 times: a content of K_2O is also growing (~30 per cent), a slight increase in silica content is recorded (Given in brackets are percentage variations in relation to a content of a component at the base).

This distribution pattern might be regarded either as primary (heterogeneity of the melt composition, possibly reflecting a heterogenous composition of target granitoids), or,which is more likely, as secondary, resuting from a vertical mass exchange in a cooling impact melt.

At an initial moment of crystallization, K_2O potential in a melt along a vertical section was not fluctuating appreciably, which is evidenced by an almost constant content of an orthoclase component in cores of plagioclase microlites, belonging to early liquidus phase (5). A fluid regime was of a reductive nature, since in crystallizing hyperstene Fe_2O_3:FeO ratio $\simeq$0,15 is minimal. The most significant are changes in a tagamite composition, which took place upon completion of liquidus crystallization as well as during vitrification of residual melt and, partly, in the course of glass devitrification. A water vapor phase, generated during cooling and characterized by a high mobility, and oxidation fluid regime, ensured a diffusive transfer of components along a temperature gradient - from base to top and from relatively more heated tagamite bodies to relati-

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vely more low-temperature bodies. This was accompanied by an intensive biolitization of hypersthene (up to its complete replacement by biotite), a development of sanidine spherulites after a glassy base, which was caused by K_2O supply and was accompanied by oxidation of most of iron monoxide. A subsequent temperature decrease and generation of small volumes of hydrothermal solutions resulted in a formation of stilpnomelane, chlorite, calcite, zeolite, pyrite, pyrrotite. However, the bulk composition of rocks remained almost the same.

A certain redistribution of components in the process of cooling and crystallization is also reported from sheetlike tagamite bodies in the Popigai and Il'inets astroblemes (6). In the tagamites of the Popigai astrobleme up the section, TiO_2, CaO and MgO contents are slightly decreased, an oxidation degree of iron is increased; biotitization of hypersthene also points to a vertical diffusion of K_2O in a cooling body. Increased up the section is an oxidation degree of iron in tagamites of the Il'inets astrobleme, as well as their K_2O content.

A certain enrichment of the upper impactite unit in SiO_2 and K_2O and its depletion in MgO and CaO is also characteristic of the sheetlike body of the Manicouagan astrobleme (7). It should be kept in mind that most rocks of the upper part of the sheet are eroded; in case of their preservation composition differentiation would be even more sharp. A more intensive redistribution of components is more characteristic of impactite bodies, which have a relatively more acid composition (≥68 percent of SiO_2) and are enriched in alcalies and water (as, for instance, in the Boltysh astrobleme). In those cases when impact melt was more basic (~58-63 percent of SiO_2) and probably, contained less water during the initial stage of cooling, this effect was weaker (Manicouagan, Popigai, Il'inets astroblemes).

The differentiation studied, which has a limited extent due to a high viscosity of impact melts and a high cooling rate of sheetlike bodies, is similar to a vertical diffusive redistribution of components established in some cooling magmatic bodies. It is likely that at early accretion stages in large masses of impact melts in giant craters this process could be more marked, and in case of a reiterated impact melting could be responsible for a primary enrichment of certain blocks of early crust in potassium and silica (8).

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