CRYSTALLIZATION IN THE SILICATE PART OF THE EXPERIMENTAL MELTED ORDINARY CHONDRITE TSAREV (L5); N.G.Zinovieva, O.B.Mitreikina and L.B.Granovsky, Department of Petrology, Faculty of Geology, Moscow State University, Lenin Gory, Moscow, 119899, Russia.

The goal of this research was the detailed petrological study on the silicate part of the immiscible sulphide-metallic-silicate melt formed during the partial melting (by microwave-heating, run at vacuum, T=1400$\pm$100^{o}C, t=20 min. [1]) of the ordinary chondrite Tsarev (L5). This research showed that there were two immiscible coexisting silicate melts different in chemical composition and crystallization temperature.

The outer part of the sample has a original chondrite structure, while the inner part has a taxite structure, consists of areas of porphyritic (APT) and intersertal (AIT) textures. The formation of these textures shows that this part of the sample has been re crystallized. There are small (up to 1 mm) relicts of the original chondrite material (Fig. 1) in the areas of the both textures.

APT (Fig. 1) consist of idiomorphic 50-150 μm-size tabular olivine crystals, cemented by the glass with fine grains of low-Ca pyroxene, Fe-olivine and sometimes troilite. The tabular (up to 150 μm) grains of olivine have a zonal structure (Fig. 2), and have the constant composition (Fa - 13) of the central parts of the grains. There is the thin (up to 5 μm) rim of olivine rich in Fe around the grains. The composition of the rim changes to the border from Fa - 26 to Fa - 31. There are fine skeletal crystals of Fe- rich (Fa - 33) olivine and needle and dendrite crystals of low-Ca pyroxene embedded in the glass. Low-Ca pyroxene forms also tabular grains <15 μm-size more xenomorphic in comparison with olivine. The tabular grains of low-Ca pyroxene are rich in Fe and Ca on the border of the grains. The cementing glass has nearly equal stehiometry to plagioclase but is quite different in the composition (average composition of the glass: SiO_2 - 60.2; TiO_2 - 0.3; Al_2O_3 - 7.8; Cr_2O_3 - 0.3; FeO - 16.3; MnO - 0.4; MgO - 4.3; CaO - 8.0; Na_2O - 1.2; S - 0.6; n = 11 analyses).

Comparing compositions and shape of crystals of different phases of APT we can make a conclusion that the only liquidus phase of this melt was Mg-rich olivine, forming the tabular constant composition grains. The others phases crystallized during the quenching, had the Fe-rich compositions and formed fine skeletal, needle and dendrite crystals (usual for super cooling systems) in the glass.

AIT (Fig. 3) consist of the tabular grains of olivine (~15x70 μm) and low-Ca pyroxene (~15x30 μm). Moreover, skeletal crystals (~10x200 μm) of olivine occur in the interstices between idiomorphic tabular crystals and all of them are cemented by the glass. The olivine grains have a zonal structure. Fe-content of olivine changes from the center (tabular: Fa - 16, skeletal: Fa - 19) to the border (Fa - 30). Tabular grains of low-Ca pyroxene are situated between more idiomorphic tabular grains of olivine. Low-Ca pyroxene has a heterogeneous composition (center of the grain: Hyp - 30, En - 66, Wol - 3, Bus - 1; border: Hyp - 40, En - 53, Wol - 6, Bus - 1). Skeletal crystals of olivine are more xenomorphic in comparison with tabular crystals of olivine and low-Ca pyroxene. These grains all together are cemented by the glass with fine crystals of low-Ca pyroxene. The average composition of the cementing glass is: SiO_2 - 60.6; TiO_2 = 0.4; Al_2O_3 - 10.3; FeO - 15.0; MnO - 0.3; MgO - 1.8; CaO - 8.0; Na_2O - 1.8; K_2O - 0.2; P_2O_5 - 0.3; S - 0.9; n = 7 analyses. It's necessary to note that the compositions of the glasses of APT and AIT are non-homogeneous, but there are two distinct groups of the compositions (Fig. 4) of the glasses. The APT glass is rich in Ca and Fe and poor in Na and Al in comparison with the AIT glass.

The crystallization of this melt began from the tabular zonal grains of Mg-olivine and Mg-low-Ca pyroxene, which are the liquidus phases of the melt. The others phases (skeletal rich in Fe olivine and needle low-Ca pyroxene) crystallized during the quenching and were cemented by the glass. Fe-rich composition of the tabular grains of olivine and wide-spread skeletal and needle shapes of crystals of AIT in comparison with APT let us conclude that the crystallization of AIT-forming melt began at the lower temperature and was faster than the crystallization of APT-forming melt.

Detailed petrological research on the results of the experiment showed that:
there were two coexisting silicate melts with sharp boundary line [2] and these two melts

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were different in chemical composition and temperature of the crystallization;

the melting of the ordinary chondrite even in "dry" (without pressure of fluid components) system shows the specific character of the differentiation of the silicate melt, led to form two coexisting immiscible silicate melts.

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REFERENCES: [1] Zetser Yu.I. et al. (1993) In: *Origin of Solar System*, A.V.Vityasev ed., Nauka Press, 112-115 (in Russian); [2] Zinovieva N.G. et al. (1994) *LPS XXV*, this volume.

FIGURE CAPTIONS: Fig. 1. Relict of the original chondrite material (in the center of the photo) in the area of the porphyritic texture. Black - Mg-rich Ol; white - Fe-rich Ol rim; light gray - cementing glass. Fig. 2. Detail of Fig. 1. Black - Mg-rich Ol; white - Fe-rich Ol rim and skeletal crystals of Ol ; light gray - needle crystals of low-Ca Px; gray - cementing glass. Fig. 3. Area of the intersertal texture. Black - Mg-rich Ol; ; white - Fe-rich Ol rim; gray - low-Ca Px; light gray - cementing glass. Fig. 4. The diagram of compositions (weight %) of the glasses of the areas of the porphyritic (1) and intersertal (2) textures.

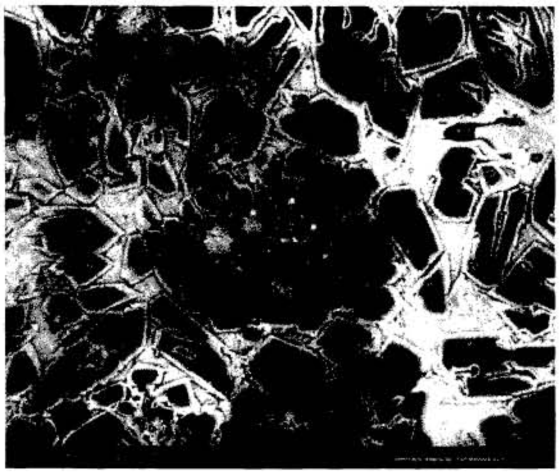

Fig. 1

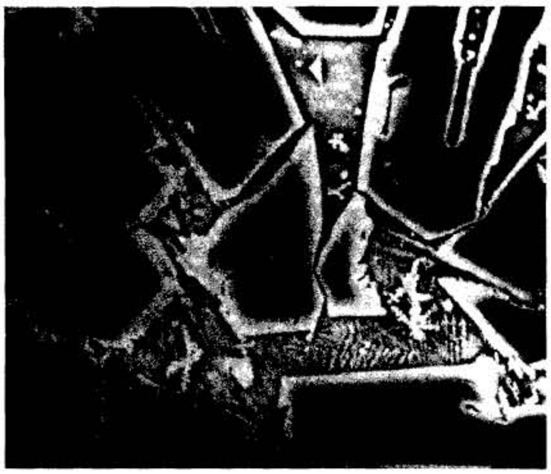

Fig. 2

Fig. 3

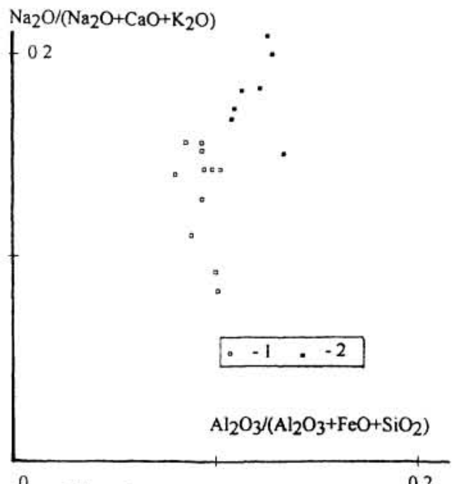

Fig. 4