Metastable Liquid Immiscibility in Zhamanshin Astrobleme Glasses as a Resalt of Sharp Supercooling of Impact Melts. Sazonova L.V., Korotaeva N.N. Moscow State University, Geological Department, USSR, 119899, Moscow.

The phenomena of stable and metastable liquid immiscibility have been found in Zhamanshin astrobleme glasses. Metastable liquid immiscibility is more often seen in highly-homogenious moderate-silicions glasses (SiO_2 ~ 65%) and in numerous glassy inclusions existing in low-homogenious, high- and very high-silicions glasses (SiO_2~ 72 and 83%, respectively) having the traces of initial shists structures. Compositions of these glassy inclusions fall into a zone of aluminosilicions metapelites in Predovsky diagram [1] and correspond to the mixture of different clay minerals and phyllosilicate existing in natural clay products. Al-rich glassy inclusions might be formed in situ as a result of a shock melt of small round concretions represented by cryptocrystal mass of clay minerals which may be found in quartzite-schists of the target.

Metastable liquid immiscibility in impact glasses appear in the form of micro-liquid, fine emulsion structures which are characterized by the presence of glassy drops of one compositions in glassy matrix of another composition (fig.1,2,). The drop compositions are close to the compositions of liquidus minerals crystallized from the same impact melts at more equilibrium melting conditions. Pyroxene, mullite, plagioclase are liquidus phases of melts having initial compositions I,II,III (table 1) respectively. The crystal phase cannot be formed at high cooling velocities and sharp melt supercooling below the liquidus temperature and the melt decomposition due to structure and chemical difference in impact melts takes place. Such melt decomposition is due to the fact that before the appearance of crystal phases in melts there appear domains of greater degree of structure order and close to liquidus phases by their x-ray characteristics than the rest of the melt. These stoichiometric groups of future mineral structure elements represent the initial step and condition of the melt crystallization at relatively slow cooling. At sharp super-cooling liquation glasses of pyroxene, mullite, plagioclase compositions (table 1) have been formed in Zhamanshin Astrobleme. In the experiments made in the system SiO_2-Al_2O_3 [2] the formation of mullite glass due to metastable liquid immiscibility has been found to occur at the temperature of 1600°C. Thus in accordance with [3] we may conclude that the degree of shock melt super-cooling reached 600-900°C.

[1] Predovsky A.L. Reconstruczia uslovi sedimentogeneza i vulkanizma rannego docembria. - Z.,"Nauka", 1980, [in Russian]. [2] MacDowell J.F., Beall G.N. - J. of American Ceramic Society, v.52, N1, p.17-25. [3] Sazonova L.V., Korotaeva N.N., Simakin A. Lun. Plan. Sci. Conf. XXII, Houston, 1991.

Metastable ...
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Table 1

Chemical Compositions of Different glasses (mass. %) where Metastable Liquid Immisibility has been observed.

	I			II			III		
	initial composit.	drops	matrix	initial composit	drops	matrix	initial compos.	drops	matrix
	38*	39	42	45	49	48	800	801	028
SiO_2	58.74	48.42	68.87	58.75	51.05	61.56	63.78	64.81	65.75
TiO_2	0.73	1.02	0.47	1.42	0.82	1.86	1.63	1.76	1.52
Al_2O_3	10.20	9.95	11.15	24.72	41.19	15.25	17.65	17.55	16.31
FeO	23.27	32.78	12.96	10.53	4.55	15.70	8.19	5.37	9.59
MnO	–	—	—	0.43	-	0.56	0.25	0.16	0.24
MgO	2.14	3.61	1.04	1.20	0.49	1.72	1.14	0.70	1.24
CaO	2.04	2.11	1.82	0.55	0.20	0.74	3.33	5.57	1.33
Na_2O	1.28	1.06	1.19	1.05	0.53	1.16	1.83	2.60	0.98
K_2O	1.60	1.06	2.50	1.35	1.11	1.47	2.20	1.48	3.04

Notes: *Analysis number. Roman figures represent initial melt compositions.

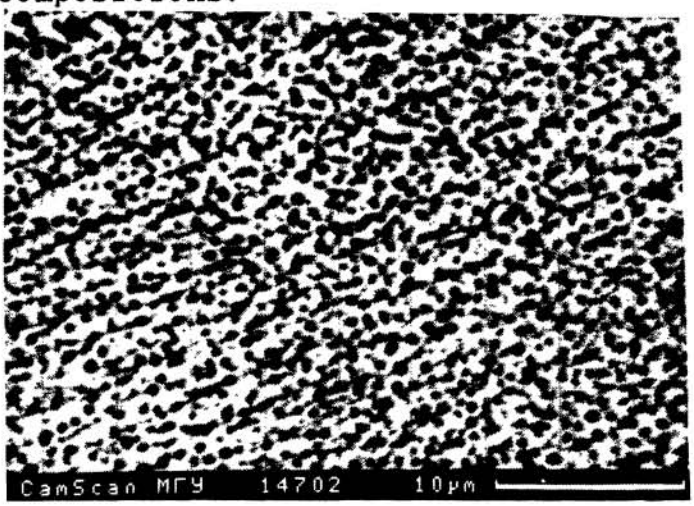

fig. 1

fig. 2