MICRO-IRGHIZITES FROM A SEDIMENT SAMPLE FROM THE ZHAMANSHIN IMPACT STRUCTURE, K. Fredriksson, Dept. of Mineral Sciences, Smithsonian Institution, Washington, DC 20560 and B. P. Glass, Geology Department, University of Delaware, Newark, DE 19711.

Introduction. Tektite glasses, called irghizites, have been found associated with the Zhamanshin impact structure about 200 km north of the Aral Sea [1]. The irghizites are important because they are the first tektite glasses found associated with an impact structure. Several authors have noted their chemical similarity to tektites, especially the Australasian [2,3].

Thousands of glass particles have been recovered from a 119 g sample of soil from the Zhamanshin structure. The glass particles are generally <1 mm in diameter and range in shape from splash forms (spheres, teardrops, dumbbells, discs, etc.) to ropy twisted forms to irregular, bumpy forms to fragments. They range from transparent pale yellow to opaque black. In this study we concentrated on the simple splash forms which we refer to as micro-irghizites. The object was to determine the relationship between the micro-irghizites, irghizites and zhamanshinites (impactites), and to determine the source material of the SiO_2-rich glasses and the nature of the impacting body.

Sample description. Although the micro-irghizites exhibit a great variation in transparency, color, and surface features, there appear to be four easily recognized end members and a large group that are intermediate in appearance. For the sake of convenience we refer to these as Types I - V. Type I, the largest group, consists of black opaque spherules. They range from shiny smooth and to frosted which may be due to fine pits and/or metallic beads on the surface. Some have a metallic luster and many are magnetic. Beads of black opaque glass are commonly attached to their surfaces. Some have vesicles. Type II are transparent, pale to dark yellow-green and range from shiny smooth to frosted to deeply corroded. The latter have surface features similar to those found on tektites and microtektites, and indeed this group closely resembles microtektites. Type III spherules are transparent pale brown to translucent dark brown. All contain vesicles. Most are shiny smooth, some frosted, and these also resemble microtektites. Type IV spherules are rare. They are highly vesicular to the point of being frothy and contain numerous lechatelierite and quartz inclusions. They range from translucent yellow to opaque brown. Type V spherules are heterogeneous and intermediate in appearance and cannot be placed into the other four groups. They range from translucent to opaque and are generally brownish or yellowish in color. They are frosted to deeply corroded. Some have vesicles.

Composition. Forty-two individual micro-irghizites were analyzed by electron probe. Although individual micro-irghizites are mostly homogeneous, they have a rather large range in composition (Table 1, Figure 1). Excluding the Type IV micro-irghizites, the SiO_2 contents, for example, range from 59-79%. The Type IV micro-irghizites are highly heterogeneous in composition apparently due to inclusions of SiO_2 phases. Average values for groups I-III are given in Table 1. The standard deviation (and Fig. 1) illustrates the variations within and the overlap between the fairly arbitrary groups. Fig. 1 also gives a comparison with tektites and impact glasses. The Ni content is generally high but variable, $\sim$0.08 to 0.41%, and correlated with FeO and MgO (Fig. 2). Some nickel occurs as metal.

Conclusions. Based on the study of glass spherules (micro-irghizites) found in a stream deposit in Zhamanshin crater we conclude: 1. The micro-irghizites overlap the irghizites and SiO_2-rich zhamanshinites in composition, but exhibit a greater variation in composition and have a lower average SiO_2

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content. This same relationship has been observed between microtektites and tektites belonging to the Australiasian (Figure 1), as well as Ivory Coast, and North American strewn fields. The chemical variations among the micro-irghizites, especially Ni, contradict the possibility that they, and the irghizites as well, are fragments of an impacting homogeneous glass body. 2. The generally high and variable nickel contents of the micro-irghizites and the discovery of Ni-Fe spherules and crystallites in the micro-irghizites support an impact origin for the Zhamanshin structure and the associated glasses. Impact glasses often have a nickel content higher than irghizites and much higher than Australasian tektites but similar to micro-irghizites, which also supports the proposition that the micro-irghizites as well as the irghizites are impact glasses. 3. The observed compositional trends favor a chondritic impacting body rather than an iron meteorite. The micro-irghizite data support an ∿8% contamination of the irghizites with chondritic material [3]. 4. The micro-irghizite data are consistent with a sedimentary parent for the irghizites with about 77 - 78% SiO_2 and variable calcium content. The range may be explained by the fact that the parent material, probably loess-like soil, is "homogeneous" in the millimeter to centimeter scale but does contain small (∿0.1 mm) mineral grains which may influence the composition of the micro-irghizites. 5. The major differences in composition between the irghizites and SiO_2-rich zhamanshinites is due to different parent materials rather than degree of meteoritic contamination.

References. 1. Florensky, P. V. and A. I. Dabizha (1980), Zhamanshin Meteorite crater. "Nauka" Press, Moscow, 127 pp. 2. Florensky, P. V. (1975), Izvestiya Akade Nauk SSSR, Seriya Geologicheskaya, No. 10, 73-86. 3. Taylor, S. R., and S. M. McLennan (1979). Geochim. Cosmochim. Acta 43, 1551-1565.

Figure 1.

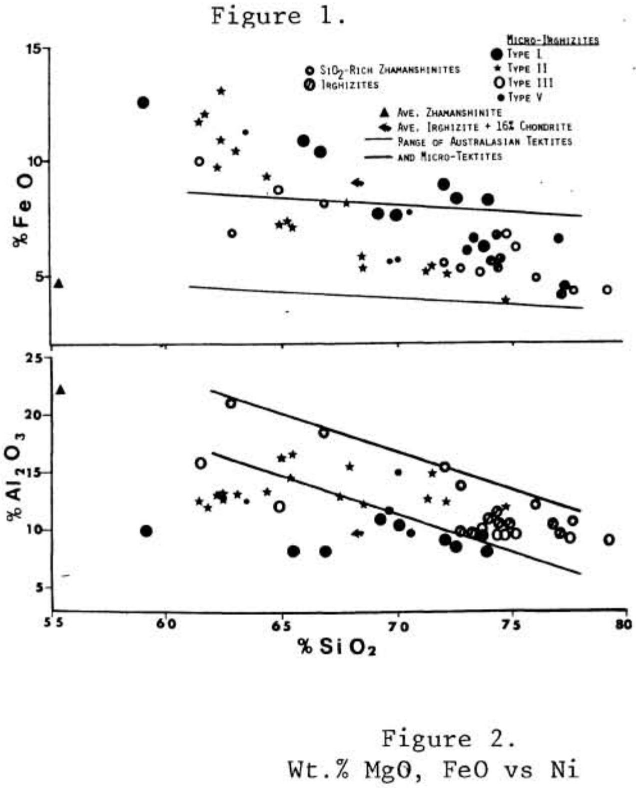

Table 1.

	Type 1(9)	Type 2(17)	Type 3(9)
SiO_2	69.2 ±4.8	66.4 ±4.1	73.1 ±5.9
Al_2O_3	9.2 ±1.1	13.6 ±1.5	10.6 ±2.2
FeO	8.9 ±1.9	7.9 ±2.6	6.1 ±2.0
MgO	5.3 ±1.5	4.1 ±2.0	3.4 ±1.0
CaO	2.1 ±1.3	3.5 ±1.7	2.4 ±0.7
Na_2O	1.0 ±0.2	1.7 ±0.3	1.2 ±0.4
K_2O	1.7 ±0.3	1.8 ±0.3	1.7 ±0.4
TiO_2	0.7 ±0.04	0.6 ±0.08	0.7 ±0.05
Ni	0.27±0.09	0.16±0.09 1)	0.12±0.04 1)

( ) Number of particles analyzed
1) 5 samples

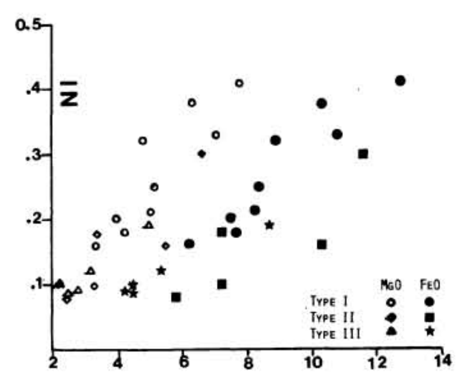

Figure 2.
Wt.% MgO, FeO vs Ni