BLUE GLASS FROM ZHAMANSHIN IMPACT CRATER (USSR)

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1. Introduction

The Zhamanshin crater, which is undoubtedly of impact origin, is the source of a wide variety of impact glasses and tektites. The crater is situated about 200 km north of Aralsk in Khazakhstan near the Irghiz River in the USSR. The geology of the crater is described in the literature (Ref. 1-). The importance of the site comes from the fact that for the first time tektites (the so-called irghizites), impact glasses or impactites (zhamanshinites), and even microtektites (Ref. - the latter for the first time on land - have been found at one crater. This yields important clues on the impactite and tektite production process. Major and trace element investigations give the opportunity to study the geochemical behaviour of these elements in impact processes and to give clues on the precursor material present at the crater site. A large number of impact glasses and country-rocks has been collected in several programs of the USSR Academy of Sciences and are subjected to mineralogical, petrological, and chemical studies. This is the first progress report on the study of some of these samples.

2. Blue Glass

A new and previously not described variety of glasses found at the Zhamanshin crater has been studied during the ongoing investigations. These glasses, which seem to be of impact origin, are of distinct blue colour. They show a layered structure with a different intensity of the blue colour in different layers, ranging from almost light blue to dark blue (almost black). A microprobe study for investigating the differences in chemistry between the layers is under way. In one sample these is a layer of about 2 mm thickness embedded in layered dark brown/black/blue glass. This layer is of light blue-turquoise colour. The bulk samples have an overall appearance which is distinct from the well-known zhamanshinites or irghizites. Although they have a layered structure they do not contain many bubbles or inclusions and are thus unlike Moung Nong type tektites.

Trace element studies of these glasses (along with a number of other Zhamanshin samples) are currently being performed, using neutron activation analysis. Some first preliminary data are given on the next page in Table 1. Data for two blue glass samples (designated Zh 31/6 A and Zh 31/6 B) are printed. From the trace element content these glasses are much more similar to zhamanshinites than to irghizites. They have a higher REE content (but a similar pattern) than the irghizites. Also their volatile element content seems to be larger (e.g. Cl, As, Cs, Rb). Some of the

siderophile elements, like Co or Cr, are, however, at a higher abundance level than in usual zhamanshinites, but still lower than in irghizites. These glasses seem to be a very interesting new impact glass variation about which we can draw further conclusions after completition of our study.

3. Irghizites

In addition to the new blue Zhamanshin impact glasses we have also analysed a number of irghizite samples for trace elements. Trace element data for irghizites are sparse (only three samples have been investigated to date for larger number of trace elements -two in Ref. 6, one in Ref. 7). Preliminary data for four more samples are reported below in Table 1 (sample No.I8501-I8504).

References

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Table 1	I8501	I8502	I8503	I8504	Zh31/6A	Zh31/6B
Na(%)	0.79	0.75	0.67	0.78	1.14	1.15
Cl(ppm)	140	180	190		500	400
Sc(ppm)	8.6	8.0	8.0	8.1	11.2	9.0
Cr(ppm)	193	195	232	163	167	111
Mn(ppm)	670	670	845	1240	750	695
Fe(%)	4.67	4.41	5.13	3.77	4.43	3.55
Co(ppm)	85	81	103	72	24	14
Ni(ppm)	1700	1730	1740		400	300
As(ppm)	2	2	2	2	2.5	3.2
Rb(ppm)	85	55	65	80	74	89
Zr(ppm)					450	600
Cs(ppm)	2.7	2.5	3.5		4.8	4.8
Ba(ppm)	580	370	560		305	240
La(ppm)	15.2	13.2	12.3	15.4	27.9	21.2
Ce(ppm)	21.7	29.9	18.4	34.4	70.1	54.7
Nd(ppm)					50	50
Sm(ppm)	2.85	2.42	2.44	3.00	6.58	4.60
Eu(ppm)	0.65	0.4	0.36	0.91	1.36	1.09
Tb(ppm)	0.45	0.53	0.53	0.75	1.0	0.79
Dy(ppm)	2.43	3.25	3.00	2.85	4.80	3.70
Yb(ppm)	1.79	1.66	1.6	1.58	3.36	2.58
Lu(ppm)	0.27	0.25	0.29	0.25	0.53	0.37
Hf(ppm)	7.9	9.2	8.9	8.8	6.4	6.3
Au(ppm)	0.04	0.04	0.04		0.06	0.06
Th(ppm)	5.37	4.76	5.40	4.52	7.23	7.29