IMPACT GLASSES FROM THE KARA AND UST-KARA STRUCTURES. D.D.Badjukov, M.A.Nazarov, and I.V.Suponeva - Vernadsky Institute of Geochemistry and Analytical Chemistry, Moscow, 117975

The Kara and Ust-Kara impact structures [1] are supposed to associate with the K/T boundary event [2,3]. If the suggestion is correct, then a material ejected from the crater should be present in the K/T boundary sediments. In the work we studied glasses from the Kara and Ust-Kara craters because impact melts should be a very important component of the ejected material.

Impact glasses are embedded in suevite deposits of the craters. In uppermost part of the deposits glasses are not very abundant. They are represented by clasts, lapilli, and bombs (up to 1 m in size). The glass clasts have often controlled shapes indicating that the clasts were in at least a plastic state when incorporated into suevites. The lapilli and bombs are usually vesicular. Suevites located near to crater bottom are enriched in glass which form schlieren bodies (up to 10 cm in thick) and veins within the rocks. The glass bodies are characterized by a flow texture. All of glasses are usually heavily altered and replaced with phyllosilicates. Fresh glasses are from transparent to dark. Their colors are black, dark and light brown, yellow-brown, yellow-green, light green, blue, and colorless. Sometimes glasses contain very small (1 μm) skeletal and equant crystals of pyroxene and sulphide droplets. In several cases a Ni-rich phase was identified in the sulphide droplets. Non-melted inclusions are represented by quartz and opaques. Compared to the glass clasts from the uppermost suevite deposits, the schlieren bodies are usually cryptocrystalline and are composed of glassy matrix containing microcrystalls of pyroxene and olivine. About 150 glass particles of 0.1-1 mm size were picked up from washed samples of suevites and analyzed by electron microprobe techniques. Big samples of fresh and altered glasses were analyzed by XRF for major and trace elements. Results of the analyses are shown on diagrams 1 and 2. If altered and rare silica rich glasses are excluded, the remaining glasses form only one chemical group. The group includes glasses of diferent colors, structures, and occurences. These diferences are not reflected significantly in glass chemistry. There are no also chemical differences between the Kara and Ust-Kara glasses. Major elements within the main group are generally not correlated but Fe and Mg show an inverse relation with Si. The element that is most variable within the group is Ca. Concentration of CaO in several particles is up to 12 wt.%. The Ca enrichment is accompanied by an Al depletion. An average composition of the main group is: SiO2 61.9; TiO2 0.87; Al2O3 15.9; FeO 6.34; MgO 4.85; CaO 4.41; Na2O 3.48; K2O 2.09 (wt%). Composition variations of altered glasses are considerable larger. These glasses, when compared to the fresh glasses, are higher in Mg and Fe, and poorer in Na. Some altered glasses are very enriched in K, but othes are very depleted in the element.

In comparision with the upper crust [4], the main glass group shows higher abundances of Ti, Fe, and Mg and lower abundances of Si and K. Sodium is only slightly lower in the glasses than in the upper crust and, therefore, the glasses are higher in Na/K ratio relative to the upper crust material. The similar chemical features were reported for Permian sediments, which are most abundant in the Kara target, and were explained by presence of a basalt component in the Permian rocks [1]. Therefore the Permian sediments can be considered as main glass-forming rocks in the Kara target. However when compared to the average composition of the Ust-Kara target dominated by the Permian rocks [5], the glasses are poorer in Fe and Mg, but higher in Ca, Na, and K. It suggests that the glass composition of the Kara and Ust-Kara crater can be best modelled by mixing of Permian rocks with limestone and/or feldspar components.

At the K/T boundary glass particles which are completely different in composition from the Kara glasses, were described by [6]. However it can be assumed that the K/T particles were formed by local processes of combustion metamorphism caused probably by the K/T impact. Usually the K/T sediments contain microtektite-like spherules [7] which are highly altered diagenetically and must have formed from a glass precursor. The Kara glasses are often very altered, and, hence, they should not be stable during diagenetic processes. The possible link between the Kara glasses and the K/T microtektite-like spherules should be considered.

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