Crystal Phases in Glasses

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We investigated crystal phases of fulgurite glasses. Fulgurites is a glassware tubular bodes, which formed after the melting of rocks by the hit of a lightning. The successful case was presented to us to study the structure and composition of two fulgurit fragments of Sonora desert (south of Mexico). Earlier we have studied the fulgurite from area of Nigoziro in Karelia, Russia, which was formed on a carboncontaining aleurolits. Thus an excellent opportunity has appeared to make the comparative analysis of fulgurits, formed on completely various geological breeds.

By data received with the help of X-Ray analysis the basic volume of all investigated fulgurite glasses is the X-Ray amorphous phase. For Mexican fulgurite it is a prevailing phase. Also we expose the heterogeneity of glasses which consists in combined presence of amorphous glassy matrix and crystalline formations with differ composition: orthoclase, hematite, chlorite, pyrite.

By the micro-probe analysis we determined that the main mass of glassy fulgurite substance is a thicken Si-Al-Fe fusion. In the main mass of fusion the areas of almost pure glasses are distinguished. The simultaneous appearance of fragments as glassy such as residual quartz in fusion tells that the temperature of fusion in that zone was near the temperature of quartz melting, this is about 1700 C.

In the outlying districts of fulgurite iron contains by the higher portions. Here we find a great amount inclusions, mainly of Fe-Al composition. In the fulgurite glass we also find an inclusions of almost pure alloy which consists from the iron and aluminium with the small admixture of magnesia. That inclusions are characterised by the good crystallographic cutting. The presence of costal growing forms tells about the post-melting formation of this inclusions. Also we often meet inclusions of hematite Fe_2O_3 . Its grains have the straight borders. The appearance of this inclusions allow as to estimate the temperature of the fusion which did not reach the temperature of hematite melting. Besides, in the glass, we find the inclusions of hematite with the tracks of partial fusion.

Appearance of a great amount skeleton formations with the composition such as FeO is an evidence of a great fusion cooling speed. Such structures forms because of dissociation on the stage of cooling.

Besides we find the numerous inclusions corresponding by structure to baddeleyite glass in the form of thin thready formations, specifying on processes of segregation proceeding in the time of hardening of fusion. These processes of segregation were not observed before in fulgurites. Also, inclusions of baddeleyite glass meets and as separate grains with crystallographic facet and with the raised contents of uranium. Besides there are alumino-silicate inclusions enriched with the titan and phosphorus. In such inclusions are widely used the clusters of ferrian composition.

Keywords: fulgurite, hematite, segregation