ENRICHMENT OF AEROLITH FUSION CRUST WITH PLATINUM-GROUP METALS DURING ABLATION

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Currently the origin and distribution of platinum-group elements (PGE) in different types of meteorites are of particular interest. It was believed that ordinary chondrites tended to increase the PGE concentration in series of H<L≪LL [1]. However, high-resolution analytical data are more likely to indicate equal concentrations of PGE in H-, L-, and LL-chondrite taenite. It appears that in case of LL-chondrites taenite overall fraction increase in the given series along with the increased concentration of PGE in the taenite in comparison with kamacite resulted in the increase of PGE concentrations [2]. Furthermore, it was found that enstatite, carbon-bearing, and G-chondrites also have comparable quantity of PGE [3–6]. Meteorites may contain PGE as admixtures, alloys, or in the native form. The discovery of metal-sulfide globule containing PGE in the ordinary chondrite fusion crust is also of special interest [7]. Such globules were found in Chelyabinsk LL5, Ozerki L6, and Kapustin Yar L/LL6 chondrites.

In general, chondrite fusion crust does not exceed 1-2 mm in thickness and it has several zones. The outer zone contains sets of accrete dendritic crystals of newly formed olivine, Cr and Ni-enriched magnetic iron and/or magnesioferrite (up to 5 μm in size) and glass (44–47 wt.% SiO_2). The inner zone consists of phenocrysts of the above minerals. Both zones tend to have rounded relics of primary olivine, chromite, and newly formed high-nickel metal-sulfide globules as well (up to 50 μm in size). Such globules usually have phases containing PGE in the fusion crust outer zone. In Chelyabinsk meteorite, Os predominates in their composition, while in the case of Ozerki and Kapustin Yar chondrites, there is a larger fraction of Pt.

The formation of such globules containing PGE is unclear. It should be noted that platinum-group metal compounds were not detected in the initial matter of Chelyabinsk, Ozerki, or Kapustin Yar chondrites. A model of chemical reduction of platinum-group metals in plasma during the ablation of aeroliths in the Earth atmosphere is proposed. The model is to be verified along with recording of optical spectra using plasmatron of the Institute of Physics and Technology, UrFU.

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