

MINERALOGICAL RESEARCH OF THE KOŠICE CHONDRITE (SLOVAKIA)

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On February 28, 2010 at 23:24:46 CET a very bright fireball over a wide area of the city of Košice in Eastern Slovakia, followed by a fall of meteorite was observed. Fireball was clearly visible from a distance of several hundred kilometres. In some parts of Eastern Slovakia and Northern Hungary also sound effects accompanying falling meteorite similar to thunder or the explosion, were recorded. Sonic booms were recorded at 7 seismic stations in Slovakia, Hungary, and Poland. Bolide was recorded also by radiometric sensors at six automatic bolide stations in the Czech Republic and one in Austria. On the basis of two private security cameras in Hungary (Örkény and Telki), which captured the fireball, trajectory and approximate location of the impact of meteorites, were calculated. Meteorite flew over Slovakia from west to east and disintegrated at explosion 35 km above the surface. Most of the meteorite fell on the area between Košice town and Vyšný Klátov village. By August 2010, 76 fragments of the meteorite were recovered of a total weight of 4.3 kg. The largest fragment is of the weight of 2.17 kg. Considering that individual meteorite fragments were found only a few weeks after the fall, the samples were only slightly affected by weathering. The Košice meteorite is the first Slovak meteorite and only the 15th with the known orbit in the interplanetary space. The meteorite Košice was officially approved by the Nomenclature Committee of the Meteoritical Society on June 27, 2011.

Mineralogical research was done mainly by using of polarized microscopy, electron microprobe (WDS, EDS, BSE, CL methods). From other analytical methods also Micro-Raman spectroscopy, ICP-MS, ICP-ES, Infrared spectroscopy, and powder X-ray diffraction, were applied.

In the thin sections meteorite is characterized by highly recrystallized fine-grained granular texture with abundant chondrules. Part of meteorite exhibits brecciated character, but individual breccia fragments show almost the same composition. Several types of chondrules are present; they are commonly indistinct and only a part of them are clearly visible. Most of chondrules contain forsterite but albite, augite and enstatite

are also abundant. Rarely, some chondrules are formed predominantly by chromite. These chondrules have granular texture and usually are not of a perfect round shape. Size of chondrules is up to 1.1 mm. The Košice chondrite has a dark gray to black fusion crust with thickness up to 0.6 mm. Fusion crust is characteristic by remelting silicates, phosphates and oxides. Fe-Ni alloys were not remelting.

Based on the average compositions of forsterite (Fa₁₉) and enstatite (Fs₁₇), high metallic Fe and other criteria, the meteorite could be classified as the H-group ordinary chondrite. According to homogeneous compositions of forsterite (*olivine*) and enstatite, absence of igneous glass, presence of secondary albite predominately as crystalline aggregates and overall texture with (relatively high metamorphic grade) enable us to classify the Košice chondrite as petrologic type H5. Planar fractures in olivine and undulatory extinction of olivine and albite as well as opaque shock veins and locally melt pockets indicate S3 stage of shock metamorphism.

Mineralogy of the meteorite is characteristic for this type of chondrite. The major non-metallic minerals of the chondrite are forsterite, enstatite and albite (Ab₈₂An₁₂Or₀₆). Additional minerals comprise augite (En₄₅₋₅₉Wo₂₆₋₄₃Fs₀₈₋₁₅), chromite, chlorapatite, merrillite/tuite, graphite and Fe-oxides. Accessory graphite (<1 vol%) was confirmed by Micro-Raman spectrometry. Metallic phases are represented mostly by taenite, iron (*kamacite*) and tetrataenite. Sulphides are represented only by troilite. Iron and taenite form characteristic immiscible textures. Chemical composition of Fe, Ni alloys shows a rising of Ni + Cu contents with current recession of Fe + Co contents. Rarely, troilite forms veinlets with taenite skeletal crystals. These veinlets are one of the primary minerals in the chondrite and may indicate mobilization of metallic elements during metamorphism or local impacts-induced phenomena.

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