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РЕЗУЛЬТАТЫ АНАЛИЗА ЧЕБАРКУЛЬСКОГО МЕТЕОРИТА (ANALYSIS OF CHEBARKUL METEORITE)

Восемь образцов Челябинского метеорита были исследованы с помощью термомагнитного и микрозондовых анализов. Показано, что основные магнитные минералы метеорита представлены двумя группами сплавов Fe-Ni с различными концентрациями никеля и сульфида железа. Подтверждено, что содержание Fe и его окисленные формы являются диагностическим критерием для идентификации типа метеорита. Результаты показывают, что Чебаркульский (Челябинский) метеорит является обыкновенным хондритом, который похож на состав неземного камня.

Eight samples of the Chelybinsk meteorite were studied using thermomagnetic and election microprobe analyses; the hysteresis loop characteristics were also measured. The main magnetic minerals of the meteorite are represented by two groups of Fe-Ni alloys (native Fe minerals) with various concentrations of nickel and iron sulfides. A small number of magnetite balls were found. They are probably formed due to oxidation of troilite and other Fe sulfides as a result of melting of the meteorite due to passage through the Earth's atmosphere. The observed effects of the primary hysteresis loop constriction is probably connected with prolonged annealing of a celestial body before its transition into the meteoroid state.

A large bolide was observed by many inhabitants of Kurgan, Tyumen, Sverdlovsk, and Chelyabinsk oblasts at 9:22 local time on the fifteenth of February in 2013. The bolide moved westward slightly to the south of Chelyabinsk. A bright fireball exploded above approximately 40 km to the southwest of Chelyabinsk. Eyewitnesses noticed several claps after the explosion. Windowpanes were broken by the shock wave in Chelyabinsk and neighboring settlements. Several buildings were damaged in a machine factory, zinc plant, and stadium. About 1500 people were injured by glass debris. Numerous meteorite fragments fell on snow and were collected by local inhabitants immediately after the explosion in the region of the aforementioned settlements. It was supposed that a large fragment pierced ice on Lake Chebarkul 70 km southwest of Chelyabinsk. Small meteorite fragments were found near a rounded hole, 8 m in diameter, but divers failed to collect any fragments from the lake floor because of the large amount of bottom silt. Expedition was sent by the Vernadsky Institute of Geochemistry and Analytical Chemistry of the Russian Academy of Sciences to the region of the fall for the collection of meteorite fragments in the nineteenth of February. This paper reports the results of the investigations of obtained meteorite material [1]. The main objective of this study was to investigate the composition of the meteorite, unearthly object.

Research article "Chelyabinsk Airburst, Damage Assessment, Meteorite Recovery, and Characterization" contains about electron microprobe studies of Chelyabinsk C3 and C4 at NASA Johnson Space Flight Center indicate that the petrography and mineral chemistry of Chelyabinsk is basically very similar to what was already reported by Nazarov and others. The meteorite is a breccia of less-shocked white clasts and moderately-shocked black clasts with abundant thin to cm-wide shock melt veins.

The shock melt veins show metal layers located about 20 micron inside the vein, but which follow the outer contours of the vein. Metal veins also project outward from the vein. It appears that this layer is more Fe-rich, whereas the dispersed individual metal grains inside the vein are more Ni rich.

Fe-Ni metal is variable in composition and locally contains minor Co. Minor phases include chromite, ilmenite, apatite, and an FeZnS compound [2].

Olivine composition was determined quantitatively by wavelength dispersive analysis. Instrument set-up conditions were 15 keV, 30 nA current, 1 micron beam. Standards for the major elements are as follows: Si, Mg: Olivine 174,1, from lherzolite nodule, Kamooloa stream Kauai; Ni, Fe: synthetic olivine; Mn – Rhodonite. Ca – Cr-augite; Cr – Chromite. Ni is below the detection limit on all points [3].

During each analytical session unknowns were calibrated using reference data for terrestrial standards. Five standards were used with a range of chemical compositions; two basalts; two and esites and one peridotite standard. The accuracy of our measurements were assessed by analyzing a series of well characterized meteorite samples and comparing our measured values with published data.

The Article "Magnetic Minerals of the Chelyabinsk Meteorite" is written according to optical microscopy and MPA (Master of Public Administration) data the Chelyabinsk meteorite is mostly composed of olivine and pyroxene, which were discriminated based on the Si/O ratio. Against the background of silicates there are clearly observable large particles of Fe minerals: Fe-Ni alloys with a relatively high Ni content and with a relatively low Ni content, troilite, rare pyrrhotite and pentlandite, sometimes chromite, single ilmenite and apatite grains. In addition, there are frequent magnetite globules, usually in the melting zone of the darkmeteorite variety.

The main carriers of magnetism in the Chelyabinsk meteorite, as well as in all other previously studied meteorites, are Fe-Ni alloys. According to their compositions, two groups with greatly varying Fe contents, relatively low and high were distinguished. At the same time, there is a distinct gap in Ni content in samples with slightly varying Co content: (1) 4–17 %, (2) 30–55 %.

The next large group of magnetic minerals of the Chelyabinsk meteorite includes Fe sulfides, among which troilite dominates. In the grains analyzed the Fe/S ratio is 1,74, which coincides exactly with that for stoichiometric pure Fe sulfide. Pyrrhotite grains occur predominantly as rare individual grains. Judging by the wide variations in Fe/S ratio values, pyrrhotite is represented by both hexagonal and monoclinic varieties. The TMA data confirms that monoclinic pyrrhotite is ferrimagnetic mineral [4].

Another common mineral in the Chelyabinsk meteorite, chromite, should be noted. It is characterized by uniform composition, usually insignificant Mg, Al, and Ti admixtures. The mineral of such composition is regarded as paramagnetic. A number of examples can show relationships between these minerals.

Authors of the article «Analytical Results for the Material of the Chelyabinsk Meteorite» affirm that the content of Fe met is a diagnostic criterion for the identification of the meteorite type. It was determined in the light-colored component on the basis of modal counting of metallic phase (2,9 wt %), which yields an Fe met content of 1,74 wt % after subtraction of Ni and Co. The estimation of ferrous iron content on the basis of the Fe/Mg value of olivine and bulk MgO content yields 17,9 wt % FeO and 2,04 wt % Fe met. Based on the Fe/Ni ratio in the metal fraction and bulk Ni content, Fe met and FeO contents can be estimated as 4,25 and 14,9 wt %, respectively. This Fe met content could be, in contrast, overestimated, because S is usually lost during the acidic digestion of samples. Nonetheless, all these estimates are within Fe met variations in LL chondrites [3]. The estimates of Fe met content in the dark component are based on the Fe/Mg value in the light-colored part, because the presence of numerous small metal grains in the impact melt hampers its determination by modal analysis. It is possible, however, that the content of the metal phase in the impact melt is somewhat higher. Compared with the mean normative composition of LL chondrite falls, the Chelyabinsk meteorite is distinctly enriched in olivine and depleted in orthopyroxene owing to the lower Si [2]. This feature is characteristic of both light- and dark-colored components of the meteorite.

Results show us that the meteorite Chelyabinsk is ordinary chondrite, which is similar to the composition of unearthly stone. It is such as earthly stones.

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БИОЛОГИЧЕСКИЕ И БИОХИМИЧЕСКИЕ МЕТОДЫ АНАЛИЗА И КОНТРОЛЬ СОСТОЯНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ (METHODS IN THE BIOLOGICAL AND BIOCHEMICAL SCIENCES FOR ENVIRONMENTAL MONITORING)

В работе рассмотрены методы экологического мониторинга, которые могут быть классифицированы на биологические и биохимические. Показано, что отрицательные биологические эффекты загрязняющих веществ, присутствующих во всех видах проб окружающей среды, могут быть оценены с использованием различных живых организмов или клеток в качестве «аналитических приборов». Названы преимущества широкого использования микроорганизмов для различных биопроб из-за легкости и низкой стоимости их культивирования, а также отсутствия этических проблем, часто сопровождающих использование высших организмов.

In the past few decades, environmental pollution has become one of the world's major concerns. A great number of toxic compounds, originating mostly from industrial and agricultural activities, are being released in to our environment continuously. In some cases harmful chemicals induce strong acute toxic effects to exposed organisms when released to the environment, but frequently the consequences are delayed due to the effects of bioaccumulation and biomagnification. Early detection of toxic chemical compounds in the environment, particularly in water, and their biological effects on organisms has therefore become increasingly important.

The traditional approach to environmental pollution assessment is based on chemical analytical methods which only provide information about the absolute concentrations of known chemicals in the environmental sample without an adequate interpretation of its toxicity to biota in the context of bioavailability, which means it only provides information about their potential, not actual toxicity. Moreover, compounds that are toxic below the detection limit of chemical