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PETROLOGICAL AND GEOCHEMICAL STUDY OF AN EXTRA-TERRESTRIAL ROCK SAMPLE FROM RUSSIA - A CARBONACEOUS CHONDRITE METEORITE?

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A few fragments from an extra-terrestrial rock discovered during 2016-2018 in Belinsky town, Russia, were analyzed. This is assumed to be a part of the meteor shower occurred between midnight 22nd -23rd of December 1886. Since this rock has an entirely different petrology and composition from the country rocks, and the sample was collected by searching in the direction of the flight path, where several other meteorites were discovered, this can be considered a "find". The sample is attracted to a 100-gauss magnet. The objective of this study is to ascertain the petrology and geochemistry of the unidentified rock so that it can be compared to known meteorites and classified accordingly. Hand specimens of this sample were studied using a polarising microscope, JEOL JXA-8230 field Emission Electron Probe Micro Analysers (EPMA), and by other geochemical techniques, including Atomic Absorption Spectrometry (AAS). Hand specimens and microscope analyses revealed that the sample is consisted of 30% - 40% macroscopic coated spherules (similar to chondrules) that are fine to large (1/8 mm - 2.00 mm) grained and spherical shaped cavities filled with white colour soft material, which are found to be calcite in a very fine to fine-grained (1/16 mm - 1/8 mm) matrix (70% - 60%). Calcite crystallization was observed on the concave inner surfaces of chondrules, under SEM. XRF analysis show following compositions: Ca-54.47%, Fe-23.20%, Mn-4.01% and P-18.33% and minor silica content. Some of the other minerals identified as gehlenite, homilite and srebrodolskite which are encountered in certain types of meteorites. The average density of the sample is ~ 1.47 g/ml, which stays in the lower range of density of carbonaceous meteorites belonging to CM sub-group, suggesting some weathering after the fall. From the results of this study, this sample can be categorised as siderolite (stony-irons) group meteorite. With the mineralogical composition, presence of calcium carbonate, chondrules abundance, and matrix abundance, it is safe to conclude that these sample may have come from a partially weathered carbonaceous chondrite meteorite belonging to CM subgroup.

Keywords: Petrology of meteorite, Carbonaceous chondrite, Geochemistry, 1886 meteor shower