

RECOVERY, LABORATORY PREPARATION AND CURRENT STATE OF THE MAIN MASS OF THE CHELYABINSK METEORITE. A. V. Kocherov¹, A. V. Korochantsev², C. A. Lorenz², M. A. Ivanova², and V.I. Grokhovsky³. ¹Chelyabinsk State University (Center for Project Management innovation and expertise), 129 Br. Kashirinykh str., Chelyabinsk, 454001, Russia, kocherov.andrey@gmail.com. ²Vernadsky Institute of Geochemistry and Analytical Chemistry, Kosygin St. 19, Moscow, 119991, Russia, rio-today@mail.ru. ³Ural Federal University, Ekaterinburg, 620002, Russia, grokh47@mail.ru.

Introduction: The Chelyabinsk meteorite (LL5) fell on February 15 2013. The main mass of the meteorite fell into the Chebarkul lake and was recovered on October 16 2013. The details of recovering process, preparation and description of the main mass of Chelyabinsk are presented here.

Circumstances of the main mass recovery: The coordinates of Cheliabinsk meteorite main mass (CMM) fall are 54°57'33.74"N, 60°19'19.58"E (measured by students of the Ural Federal University on February 17, 2013). CMM fell into the lake Chebarkul and broke the ice forming a 7 m hole in the ice. Numerous small fragments (0.5 - 1 g) were scattered around the hole on the snowy icy crust. An upper layer of the Chebarkul lake's bottom comprised by the silt sediments. The fragments up to 110 g were recovered from the surface layer of a silt (Fig. 1). Total documented mass of meteorite samples directly recovered from the bottom during the first month after the meteorite fall was ~5 kg. About 10 kg of meteorite fragments, recovered by local residents using the magnets were not documented.

Underwater engineering works were proceeding from 05.09.13 to 16.10.2013 and included a search of CMM location using the ultrasonic sonar and the following pumping of the silty mud from the selected area, ~30 x 35 m. A water depth at the CMM location was ~11 m; a thickness of the silt layer was in a range of 10 – 12 m.

During the pumping and diving processes 15 stony samples were recovered from the silt. However due to a bad visibility in a cloudy water and silty covering of the samples, only 8 of them, including the CMM were identified as the meteorite fragments (Fig. 2), while the rest 7 ones represented terrestrial rocks. The CMM was about 540 kg, the total mass of other 7 meteorite fragments was 84.4 kg.

The bottom sediments have sapropel composition that provided reducing environment that prevented the CMM oxidation. Immediately after recovery and draft cleaning, the CMM had a fresh black surface.

Laboratory preparation: After recovery, the CMM was transported to the Chelyabinsk museum of local lore and prepared for exhibition. During the first week after recovery the CMM was cleaned and placed in the podium under a glass cover. Several large pieces

~40 kg of total mass were peeled from the CMM along the plane of the crack, that crossed the CMM parallel to direction of the meteoroid flight.

Description of the main mass: The CCM has approximately pyramidal shape of 88x66x62 cm in size. The top of the pyramid corresponds to a front part of the meteorite. The sides of the CCM are covered by the regmaglypted surfaces and mostly preserved black fusion crust. The fusion crust is textured by a net of thin cracks. The areas of the pyramid's facets closed to a rear side of the meteorite are covered by shallow frequent regmaglypts propagated along the flight direction, while the medium parts of the pyramid sides are covered by coarse regmaglyptes. Some of the regmaglyptes were up to ~4 cm depth, two largest ones are ~5x10 cm of size and ~6 cm depth.

There are at least two sub-parallel fractures crossing the pyramid of CMM. Probably, the fractures were formed during the fragmentation of the meteoroid in the atmosphere or when meteorite hit the ice.

Unfortunately, it is not easy to dry well the large mass of the chondrite, and some atmospheric oxidation of the CMM surface started immediately after the meteorite recovery from the lake.



Fig. 1a



Fig. 1b



Fig. 2a. Sample #1, 0.94 kg, 8x11.5x6.5 cm



Fig. 2b. Sample #11, 3.94 kg, 12.5x16.3x12 cm



Fig. 2c. Sample #8, 4.74 kg, 10.8x13.4x19.5 cm



Fig. 2d. Sample #6, 0.997 kg, 7.1x9.4x8.0 cm



Fig. 2e. Sample #14, 64.7 kg, 42.3x34.5x24.6 cm



Fig. 2f. Sample #13, 7.75 kg, 23.3x20x12 cm



Fig. 2g. Sample #5, 1.3 kg, 13.8x10.4x6.2 cm



Fig. 2i. Sample #15, ~540 kg, 88 x 66x 62 cm

Fig. 1 (a, b). The samples of the Chelyabinsk meteorite fished out by magnet from the bottom of the lake during the first month after the meteorite fall. The masses are given in grams.

Fig. 2. The Chelyabinsk chondrite samples recovered during the underwater works.