MINERALOGICAL CHARACTERISTICS OF 20 NEW SAMPLES FROM THE ALMAHATA SITTA STREWNFIELD.

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Introduction: After asteroid 2008 TC_3 impacted Earth in 2008, many different meteorite types (achondritic and chondritic) were identified among the numerous meteorite fragments (e.g., [1-11]). The recognition of scientifically valuable samples is still ongoing [12,13]. Here, the mineralogical characteristics of 20 new samples are presented.

Results: All 20 new samples represent only one meteorite type (achondritic or chondritic) weighing between 1.7g (MS-227) and 18.0g (MS-207). The presence of a single meteorite type is the typical characteristic of the individual fragments, although a very interesting exception was recently described [13] showing that complex breccias also exist among the Almahata Sitta samples. Among the new samples are 15 ureilites (10 coarse-grained, 5 fine-grained) and 5 enstatite chondrites. Most of the samples were recovered in 2014.

E-chondrites: As in many cases the identified enstatite chondrite fragments are small: MS-211 (6.4g), MS 217 (13.2g), MS-221 (7.3g), MS-224 (7.8g), and MS-225 (6.8g). MS-221 (EL_b4; see [14] for the new classification system) and MS-224 (EH_a3) clearly show a perfect chondritic texture, wheres the others represent different EL_b6 chondrites. Olivine (Fa_{0-1}) was found in some chondrules from MS-224 (Fig. 1a). MS-225 contains some large, coarse-grained objects (perhaps chondrule relicts) having blue areas in transmitted light, which may be due to the occurrence of small <<1 µm Ti-rich grains (perhaps rutile) in plagioclase (Figs. 1b,c). Kamacite in MS-211, MS-217, MS-225, and MS-221 has mean concentrations of Si and Ni of ~1-1.5 and ~7-8 wt%, respectively (typical for EL_b-chondrites). The Cr-concentration in troilite in these samples is above 2.5 wt%. MS-224 (EH_a3) has kamacite with 3.2 wt% Si and 6.3 wt% Ni and troilite with 1.3 wt% Cr (see [14]).

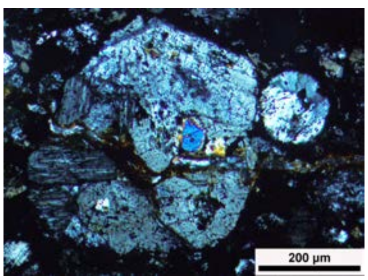

Fig. 1a: Olivine (blue) in a chondrule

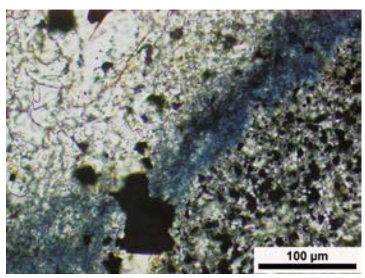

Fig. 1b: Blue area around a relict chondrule

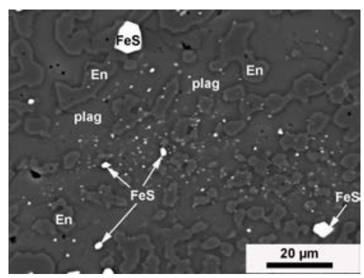

Fig. 1c: Tiny white Ti-rich particles in plagioclase

Ureilites: 15 ureilites are among the new Amahata Sitta samples and can arbitrarily be subdivided into fine-grained ureilites, Ol-rich, coarse-grained, and Px-rich, coarse-grained ureilites. MS-207 (18.0g), MS-212 (1.8g), MS-213 (9.3g), MS-215 (7.2g), and MS-216 (3.8g) are heavily-shocked, fine-grained ureilites. MS-212 and MS-216 are completely fine-grained and olivine is ~Fa_{9-11}. Some have somewhat variable textures considering the sub-grain sizes of the mosaicized olivine (MS-207, MS-213, and MS-215). These olivines have cores with about 20-22 mol% Fa. MS-208 (9.7g; composition of olivine cores: Fa_{19-21}), MS-209 (7.6g; Fa_{18-20}), MS-214 (14.1g; Fa_{12-14}), MS-218 (6.1g; Fa_{19-21}), and MS-227 (1.7g; Fa_{8-9}) are coarse-grained ureilites with abundant olivine, whereas MS-210 (8.2g; Fa_{11-15}), MS-219 (2.5g; Fa_{10-11}), MS-220 (11.0g; Fa_{3-4}), and MS-222 (8.0g; Fa_{11-13}) have considerable abundances of pyroxenes. In MS-226 (2.8g; Fa_{11-12}) pyroxene is by far the most abundant silicate. MS-220 has Fe-poor silicates.

Conclusions: All samples from the Almahata Sitta strewn field are highly valuable samples. Every new sample confirms the importance and peculiarity of asteroid 2008 TC_3 and provides new information about the reaccretion of ureilitic fragments forming a second-generation parent body. The incorporation of xenolithic materials may have occurred in the same process of reaccretion or by later impacts.

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