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

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Introduction: After asteroid 2008 TC3 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 (ELb4; see [14] for the new classification system) and MS-224 (EHa3) clearly show a perfect chondritic texture, whereas the others represent different ELb6 chondrites. Olivine (Fa0-1) was found in some chondrules from MS-224 (Fig. 1a). MS-225 contains some large, coarse-grained objects (perhaps chondrule relics) 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 ELb-chondrites). The Cr-concentration in troilite in these samples is above 2.5 wt%. MS-224 (EHa3) has kamacite with 3.2 wt% Si and 6.3 wt% Ni and troilite with 1.3 wt% Cr (see [14]).

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 ~Fa9-11. Some have somewhat variable textures considering the sub-grain sizes of the mosaiced 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: Fa19-21), MS-209 (7.6g; Fa18-20), MS-214 (14.1g; Fa12-14), MS-218 (6.1g; Fa19-21), and MS-227 (1.7g; Fa8-9) are coarse-grained ureilites with abundant olivine, whereas MS-210 (8.2g; Fa11-15), MS-219 (2.5g; Fa0-11), MS-220 (11.0g; Fa3-4), and MS-222 (8.0g; Fa11-13) have considerable abundances of pyroxenes. In MS-226 (2.8g; Fa11-12) 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 TC3, 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.