

PPS004-10

会場:101

時間:5月27日 16:45-17:00

## Petrological characteristics of TIL 07007, a highly deformed CV3 chondrite Petrological characteristics of TIL 07007, a highly deformed CV3 chondrite

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Thiel Mountains (TIL) 07007 is a CV3 chondrite found at the blue ice field near Thiel Mountains, West Antarctica by the 2nd Korea Expeditions for Antarctic Meteorites (Weisberg et al., 2010; the official Meteoritical Bulletin website). It weighs 18 gram. Terrestrial weathering grade of the meteorite is W1 and shock stage is S2. A thin section of the meteorite (SNU-T068) having ~266mm<sup>2</sup> was studied for petrological characteristics with an optical microscope, scanning electron microscope and electron microprobe analyzer. In the thin section, TIL 07007 consists of ~53 vol. % of chondrules, ~17% of refractory inclusions and ~28% of matrix. The chondrules and refractory inclusions are elongated and aligned to form foliation. Several micro-faults are recognized in some chondrules.

Total 170 chondrules (not including fragments) were recognized using backscattered electron images taken from the thin section. Majority of chondrules are porphyritic olivine chondrules having low-FeO contents in olivine (Fa contents < 6.5).

More than 20 refractory inclusions are found in the thin section. Majority of them are type-B Ca-Al-rich inclusions (CAIs); there are also a few melilite-rich type-A CAIs and ameboid olivine inclusions. In the type-A CAIs ~20 micron-size euhedral spinel grains enclosed by coarse grained melilite grains occur along with hibonite and perovskite. Akermanite contents in melilite vary from 5.4 to 16.8%. In the type-B CAIs, smaller (1-5 micron) spinel grains occur in Ti-Al-diopside and melilite grains. Some type-B CAIs have core and mantle structures. Melilite in type-B CAIs has wide range of Akermanite contents from 6.4 to 79.8%.

Average of areas occupied by single chondrule in the thin section is ~0.75mm<sup>2</sup>, which is somewhat larger than that we measured in Allende (~0.49mm<sup>2</sup>). Averages of major and minor axes are 1.13 and 0.67mm respectively giving the eccentricity of ~0.75 (aspect ratio of ~1.7).

These elongated chondrules are aligned with a preferred orientation: standard deviation in degree from the average elongation angle is 30. Refractory inclusions are also strongly elongated and aligned to the same direction with the chondrules. Only known chondrites having such a strong foliation structure by elongated chondrules (and/or CAIs) are Leoville (CV3, e.g., Cain et al., 1986) and Ghubara (L5). Cain et al. (1986) suggested that compaction due to overburden from progressive accretion caused the deformation of Leoville, while Nakamura et al. (1992) interpreted as the results of multiple impacts with relatively mild pressures (5-20 GPa).

In TIL 07007, chondrules, CAIs and AOIs are all elongated to the similar shape and aligned with the same orientation, suggest that they deformed in situ in the parent body, possibly by impacts. Micro-faults in chondrules were probably formed by the same impact events.

### References:

Cain, P. et al. (1986) *Earth and Planetary Science Letters* 77, 165-175.

Nakamura, T. et al. (1992) *Earth and Planetary Science Letters* 114, 159-170.

Weisberg, M. K. et al. (2010) *Meteoritics and Planetary Science* 45, 1530-1551.

キーワード: meteorites, chondrites, chondrules, Ca-Al-rich inclusions, deformation

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