

Reproduction of space weathering of C-type asteroids by laser heating experiments of Murchison CM2 chondrite

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We performed reproduction experiments of space weathering of C-type asteroids by laser heating on a primitive meteorite. Pellets of powdered Murchison CM2 meteorite were exposed to pulse laser (5, 10, 15 mJ) with a diameter of 0.5 mm (details of experiment are given in [1]). The reflectance spectra become darker and bluer with increasing energy of laser beam to 15 mJ. This reproduces space-weathered spectra of C-type asteroids show spectral bluing [2]. In particular, UV reflectance increases and 0.7- and 3- μm band depths decrease as the laser energy increases. Laser heating causes break down of serpentine to amorphous, which is conformed by TEM observation. The decrease of 3- μm band depth indicates dehydration of serpentine and other hydrous phases.

The UV absorption strength and the 3- μm band depth show a positive correlation. Compared to experimentally heated Murchison for a week [3], the laser irradiated Murchison shows lower UV absorption / 3- μm band depth ratios. This indicates that changes of 3- μm band is insensitive in the case of laser heating, which probably resulted from incomplete degassing from laser-irradiated portions during fast cooling.

[1] Yamada *et al* (1999) *Earth Planets Space* **51**, 1255-1265

[2] Nesvorný *et al* (2005) *Icarus* **173**, 132-152 [3] Hiroi *et al* (1996) *Meteoritics & Planetary Science* **31**, 321-327