Irreversible metamorphism of warm C-type Near-Earth Asteroids investigated with carbonaceous chondrites

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METHODS AND SAMPLES

Bidirectional reflectance spectroscopy of carbonaceous chondrites under NEA-like environment (pressure 10⁻⁶-10⁻⁸mbar, from room temperature to 523K), with
the spectro-gonio radiometer SHADOWS [1].

Selection of 10 CM chondrites (CM1, CM2 and heated CM2) to be compared with observations with AKARI [2].

RESULTS

Visible range
- Loss of amplitude, broadness
- Shift of the 700 and 900nm band
3µm band:
- Loss and amplitude and broadness
- Increase of sharpness
- Shift of the minimum position
Organics feature
- Increase of amplitude

Fig. 1: Resulting spectra acquired at room temperature before and after the temperature experiment

Order of the polyaromatic carbonaceous matter before and after the temperature experiment assessed using Raman spectroscopy:

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Fig. 2: Scheme of the wavelengths used to calculate the symmetry factor

Fig. 3: Variations of the parameters of the 3µm band during the temperature experiment

The more altered the meteorite, the less variation by the temperature experiment

Apparent shift of the complete band due to alteration of some components

COMPARISON WITH ASTEROIDS OBSERVATIONS

Fig. 4: Modelled 3µm band of the meteorite Tagish Lake before and after the temperature experiment showing the variations of all components

No clear sign of organics related features in the reflectance spectra of asteroids

High temperature → graphitization
Space weathering → amorphization

This research is based on observation with AKARI, a JAXA project with the participation of ESA.