Phase angle dependency on reflectance spectra and ultraviolet spectroscopy of carbonaceous chondrites.

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The Hayabusa2 spacecraft was launched in 2014, and is expected to arrive at the asteroid Ryugu, which belongs to the C-type asteroids. One of the objectives of the Hayabusa2 mission is to return primordial samples that do not show advanced thermal metamorphism. Vilas (2008) used reflectance spectroscopy from the ground to determine that Ryugu has absorption of approximately 700 nm, indicating the presence of hydrated minerals. The Hayabusa2 spacecraft performs multi-band spectrum observation using ONC-T, which is a telescopic optical navigation camera with seven band-pass filters, and specifies the spot at which the 700 nm absorption feature exists for landing. Therefore, it is important to confirm the detectability of the absorption of 700 nm from multi-band spectral observation. We performed multi-band spectral imaging of carbonaceous chondrites that indicate the same reflectance spectrum as C-type asteroids by using the ONC-T flight model and detected the 700 nm absorption feature at a phase angle of 30° for light-source-sample-ONC-T (Kameda et al, 2015). On the contrary, the phase angle of sun-Ryugu-Hayabusa2 is expected to vary in the range from 0°-40°, while the Hayabusa2 spacecraft is in the vicinity of Ryugu. Therefore, it is also necessary to confirm the detectability of the 700 nm absorption feature in the phase angle of 0°-40° from multi-band spectral observation.

In this study, we perform reflectance spectroscopy of these carbonaceous chondrites using a camera that imitates ONC-T to detect the 700 nm absorption feature in the phase angle range of 0°-40°.

We construct an experimental system in which the incidence angle is variable in the range of 0°-40°and the emission angle is fixed by using a half mirror and a rotation stage. We measure the reflectance spectra and depth of the 700 nm absorption feature of the carbonaceous chondrites using a camera having the same CCD and bandpass filters with nearly identical center wavelengths as that of ONC-T. In this presentation, we report a result.

Moreover, this paper discusses the progress of an investigation about identification of satellite surface materials by ultraviolet observation for a Mars satellite exploration project planned for launch in 2022.

Keywords: Small Solar System Bodies, Multi-band imaging, carbonaceous chondrite

