# Spectral measurements of carbonaceous chondrite in the extreme ultraviolet range

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Spectroscopic observations have been done in many space exploration missions for the purpose of revealing physical quantities and material compositions of the objects. In particular, overviewing past missions focusing on the surface environment of solid planets, the infrared (IR) and visible have been commonly used. On the other hand, in recent years, there are some missions doing spectroscopic observations in the ultraviolet (UV) region, such as MESSENGER, MAVEN, and DAWN. One of the reasons that these missions select UV is that this band represents the features of the state of molecular electronic transition. These features are impossible to identify through IR or visible. The state of molecular electronic transition changes over time due to exposure to cosmic rays and solar radiation. This effect is called “space weathering” and its quantitative assessment links the current features obtained from observations with the past appearance of the substance. For example, it is known that spectra of hydrocarbons redden by the cutting of C-H bond due to space weathering.

To discuss the physical and chemical state of the celestial body from the spectra obtained from the spectroscopic observations, it is necessary to measure the spectra of the samples to be compared in the laboratory. The carbonaceous materials that we focused on in this study can be materials for life, and their state is of great scientific significance. As a general trend, these materials have a low reflectivity not only in the UV but also in a wide wavelength range, which makes it difficult to measure them. However, in the near ultraviolet (NUV) range (200nm$< \lambda <$380nm), the spectra of carbonaceous samples such as graphite and coal are already measured “Applin et al., (2018)”. On the other hand, in the extreme ultraviolet (EUV) range ($\lambda <$150nm), the reflectivity is even lower than that of NUV and the types of light sources that can be used are limited, so that a measurement method has not yet been established.

We established the method to measure the reflection spectrum of carbonaceous chondrite using a high-frequency excited gas flow lamp that can also give off EUV light, instead of a deuterium lamp that has been widely used as an UV light source. In this presentation, we will introduce the details of the reflectance measurement method and the spectrum of the Allende meteorite taken through the system.

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