**UV SPECTROSCOPY OF EXTRATERRESTRIAL MATERIALS: A NON-INVASIVE AND NON-DESTRUCTIVE METHOD FOR IDENTIFICATION OF ORGANIC COMPONENTS IN METEORITES**

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**Introduction:** VIS-NIR reflectance spectroscopy (wavelength range ~ 300 – 1500 nm) is an important technique in planetary exploration: the major groups of silicate minerals have characteristic features in this spectral range, enabling data from instrumentation on-board spacecraft to be compared with equivalent information from laboratory analysis to determine the mineralogy of planetary surfaces (Figure 1). Classification of asteroid families, matching spectra to those of meteorites has enabled identification of parental sources for the meteorites, e.g., Vesta as the source of HED [3]. At lower wavelengths, moving into the UV part of the spectrum, organic species exhibit characteristic features. Given the continuing interest in organic species within the Solar System, it is appropriate to match UV spectra from planetary surfaces with analogous spectra from meteorites and other extraterrestrial materials, in order to determine the distribution and identity of organics within the Solar System.

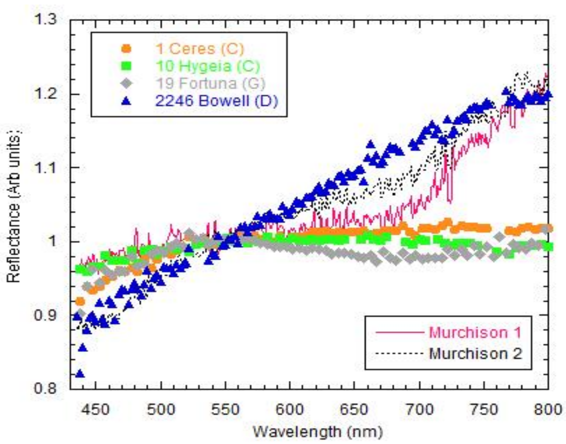


*Figure 1: Visible wavelength reflectance spectra from 2 samples of powdered whole-rock Murchison acquired at the OU [1], compared with spectra from primitive asteroids [2].*

**Method:** Reflectance spectra of a series of powdered carbonaceous chondrites were obtained using a CRAIC UV-Vis microspectrophotometer (MSP) fitted with 3 Cassegrain objective lenses and a detector sensitive between 200 and 2500 nm. The MSP had a xenon light source with useful spectral range of 300 – 800 nm focusable through the microscope to an area 2 x 2 µm in size [4]. The MSP was recently been fitted with a deuterium light source with spectral range 190 – 2500 nm, extending the useful range of the MSP into the UV and the NIR regions of the spectrum. The technique is complementary with methods that look at finely-ground homogenized powders [5], as we are able to obtain spectra from either powdered materials or thin sections, as long as the grains fill the 2 x 2 µm field of view.

**Results:** We have calibrated the MSP using a series of organic molecules, the spectra from which have been normalized using the Spectralon$^{TM}$ white standard. As shown in the Figure, when the VIS reflectance spectra are normalized (at 550 nm), the Murchison spectra match most closely with the reflectance spectrum of the D-Class asteroid 2246 Bowell. Using the same technique, we measured the spectra of two PAH: the 3-ringed molecule anthracene and the 6-ringed molecule coronene. When these spectra are normalized and compared with the spectra from Murchison, although they have a similar positive slop in blue colour, no specific features are apparent. The UV spectra are very distinctive, with strong features associated with electron transitions between energy states. Below 300 nm though, problems of signal/noise ratio become more apparent. We are still working to caibrate the xenon light source; results obtained from the new source will be presented at the meeting.

**References:** [1] Farsang S. et al. (2016). *79$^{th}$ Ann. Mtg. Met. Soc.* Abstract # 6213; [2] Bus S. and Binzel R. P. 2002. *Icarus* 158, 106; [3] Binzel R. P. and Xu S. (1993). *Science* 260, 186-191; [4] Fernandes C. D. et al. 2001. *Int. J. Astrobiol.* 5, 287. [5] Appin D. et al. (2018). *Icarus* 307, 40–82.

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