UV FLUORESCENCE/RAMAN IMAGING OF ALLENDE

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Introduction: UV fluorescence/Raman imaging is a relatively new technique well suited to the detection and study of organic compounds [1]. Excitation at wavelengths shorter than ~300 nm tends to remove most mineral fluorescence, simplifying the detection of even diffuse organic compounds at standoff distances and with minimal or no sample preparation. We report preliminary results from UV fluorescence/Raman imaging of fractured samples of the Allende meteorite as a means of 1) assessing the composition of carbonaceous chondrites in a spatially resolved fashion, and 2) identifying exogenous carbonaceous material delivered via meteoritic infall as a necessary step in identifying native carbonaceous material in samples examined by rover-based instrumentation.

Description: UV fluorescence/Raman imaging has been identified as a promising technique for future landed missions on planetary, asteroidal and cometary bodies due to its capability to detect and charactize diffuse organics. This capability has been demonstrated in terrestrial samples such as light carbonaceous compound-laden peridotite xenoliths and evaporite minerals with entrained sporulated microbes [2]. We report here the examination of cm-sized fracture surfaces of samples of the Allende CV3 meteorite, imaging the meteorite interior with micron-scale spatial resultion to reveal composition of the carbonaceous materials within. Results show distributed a light PAH-like component within the macromolecular carbon-bearing matrix that indicates relatively lesser thermal processing than the carbonaceous component within Allende chondrules. This PAH-like component is likely an inter-linked unit within a larger macromolecular carbon material. Chondrule-hosted carbonaceous material contains a greater proportion of larger PAH-like components on the scale of anthracene. If we assume a similar starting material for both materials then the chondrule-hosted carbonaceous material has been thermally processed to contain a greater fraction of larger components. This finding is generally consistent with the notion that chondrules have been heated to a greater degree than the macromolecular carbon disseminated in the meteorite matrix.

UV fluorescence/Raman imaging has been utilized to examine a carbonaceous chondrite and to produce micron-scale imaging data of the structure of meteoritic carbon. Further development of this technique will allow fundamentally new studies of extraterrestrial carbonaceous materials as well as *in situ* investigations of these materials on landed missions. Future use includes identification and characterization of carbonaceous materials with the goal of identifying carbonaceous material of biogenic origin.

References: [1] Bhartia R. et al. *Applied Spectroscopy* 62 (2008) 1070-1077. [2] Bhartia R. et al. 41st LPSC conference (2010) Abstract #2674.