

TOWARDS A BETTER CHARACTERIZATION OF EXTRATERRESTRIAL ORGANIC MATTER WITH MICRO-RAMAN SPECTROSCOPY

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The abundant organic compounds in primitive meteorites and interplanetary dust particles (IDPs) are thought to originate largely in the interstellar medium, but parent body alteration has altered their carbonaceous microstructures. It has been suggested that meteorites and IDPs were significant sources of complex organic matter on the early Earth. We are conducting a survey to assess the range of material that would have been delivered, and to generate a database for comparison with STARDUST samples.

Raman spectroscopy is a sensitive, easy applicable and relatively little destructive tool for analyzing the microstructure of carbonaceous material. Single crystal graphite and disordered finite-sized microcrystallites exhibit the distinctive "G" and "D" Raman bands. Their peak height ratio, relative positions and half widths are useful for characterizing the crystallinity and hence the metamorphic history of the analyzed material.

We present results of Raman spectroscopy of well-characterized high-purity organic residues from various chondrites in order to assess the homogeneity of the carbonaceous

material, correlate the spectra with metamorphic grade and known microstructures, and search for relationships within and between the meteorite classes. This will help to identify the most primitive organic matter assemblage, evaluate effects of heating and hydrolysis, and allow comparisons with IDPs and returned STARDUST samples. We have prepared more than 35 residues from 1-10g samples of all chondrite classes. This improves the Raman photon yield compared to bulk sample analyses and the representativeness of the samples.

Initial measurements of the aqueously altered CM chondrite Murchison and the thermally metamorphosed CV chondrite Allende show that the residues yield Raman results that are similar to those of their host bulk rocks. The two meteorites show large spectral differences that can be attributed to the distinct histories experienced on their parent bodies.