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MID-INFRARED STUDY OF SAMPLES FROM MULTIPLE STONES FROM THE SUTTER'S MILL METEORITE.

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Introduction: The Sutter's Mill meteorite fell in N. California on April 22, 2012 and numerous pieces have been recovered and studied [1]. We present Fourier-transform infrared (FTIR) spectra of fragments from several stones of the meteorite.

Methods and analysis: Infrared spectra of the samples were recorded with a Nicolet iN10 MX FTIR microscope in the mid-IR range (4000–675 cm⁻¹; spectral resolution 4 cm⁻¹). All samples were deposited on a clean glass slide, crushed with a stainless steel roller tool, and placed directly on the focal plane of the microscope. IR spectra were collected by averaging 128 scans.

Results: Preliminary IR spectra of the non-fusion crust samples show mineral compositions that are dominated by phyllosilicates, carbonates, or mixtures of both [2]. The carbonates display a dominant, broad band centered at 1433 cm⁻¹, with additional bands at 2515 cm⁻¹, 1797 cm⁻¹, 882 cm⁻¹, and 715 cm⁻¹). Features associated with phyllosilicates include a symmetric Si-O stretching mode band centered at 1011 cm⁻¹ and several O-H stretching mode bands. The O-H shows up in two forms - a broadband centered at 3415 cm⁻¹ that is probably largely due to adsorbed H₂O and a much weaker, narrower feature centered near 3680 cm⁻¹ due to structural -OH.

Features observed in the 2985–2855 cm⁻¹ range suggest the presence of aliphatic -CH₃ and -CH₂- groups. The relative intensities of the bands in this range are somewhat unusual. Typically, the asymmetric aliphatic C-H stretching bands are stronger than the symmetric stretching bands, but in this case the reverse is true. This unusual pattern is well matched by the aliphatic features seen in the spectrum of a terrestrial calcite (CaCO₃) standard. This observation, and the fact that the strength of the carbonate and aliphatic bands seem to correlate, suggest the organics are associated with the carbonates.

Conclusions: IR spectra of samples from the Sutter's Mill meteorite show absorption features associated with carbonates, phyllosilicates, and organics. Both the unusual band profile of the aliphatic C-H stretching mode bands and their correlation with the strength of the carbonate bands suggests the organics and the carbonates are associated in some manner.

References: [1] Jenniskens, P. et al. (2012) *Science*, 338, 1583; [2] Sandford, S. (1984) *Icarus*, 60, 115.