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FT-IR SPECTROSCOPY OF CAI AND CHONDRULES IN PRIMITIVE CHONDRITES: TECHNIQUES AND FIRST RESULTS

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Introduction: CAIs and chondrules are the earliest macro-components formed in the solar system, and are thus an important step in the formation of larger bodies: They are also a significant stage in the evolution of interstellar dust to planets.

Here we present preliminary mid-infrared spectra of CAI, chondrules and matrix from the CV3.2 carbonaceous chondrite Allende. This is part of our ongoing project to compile a database of infrared and optical spectra of minerals and components of primitive meteorites. These spectra should allow a better comparison with spectra from astronomical sources e.g. from dust and molecular clouds or young solar systems.

Techniques: First, chondrules and CAI were handpicked from gently crushed sample of Allende. The components were cleaned with alcohol and dried. For the analyses, selected chondrules and fragments of CAI were crushed with an agate mortar or a diamond compression cell to a fine powder (the Allende matrix material was used without grinding). The CAI was also characterized with XRD for its mineralogical composition. The infrared spectra have been taken with a Perkin Elmer Spectrum One workbench, using the Diffuse Reflectance Accessory. The powdered material was put on a metal coated abrasive disc, of which a background spectra was taken before. Spectra were taken over a wave number range from 4000 to 250cm⁻¹, with a spectra resolution of 4cm⁻¹. The results have been converted to absorbance units using the Kubelka-Munk algorithm.

Results: Fig.1 compares the results for a chondrule, a compact type A CAI (mainly Gehlenite and Grossular) - and matrix material from Allende with a Fo₅₀ standard olivine. The chondrule spectrum is virtually indistinguishable from olivine analyses. Similar, the matrix analysis reflects the dominance of olivine. The spectra of the CAI fragment differs clearly and shows three characteristic bands at 1011cm⁻¹, 969cm⁻¹ and 912cm⁻¹

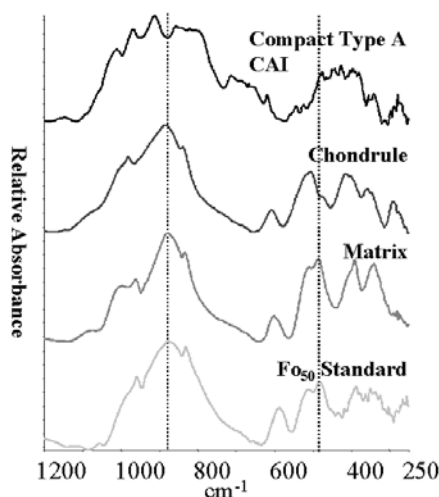


Fig.1: FTIR spectra of components in Allende, compared with a Fo₅₀ standard

References: [1] Morlok A.; Grady M. M. 2004 in prep.