MICRO-IR REFLECTANCE AND TRANSMITTANCE ANALYSIS OF THE PARIS CARBONACEOUS CHONDRITE

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We will present a selection of results ([1,2]) based on FTIR micro-spectroscopy and hyperspectral imaging (1.5-15 µm) of two different samples of the Paris meteorite (the least altered CM2 chondrite [3,4]) The first one is a wide area (500x500 μm^2) of a millimetric fragment directly measured in reflectance without any preliminary preparation of its surface. The region includes matrix and chondrules and is chosen for its mineralogical and chemical diversity. The second one is a micrometric particle pressed between two diamond windows and measured in transmittance with a spot of 0.7 µm. Spectra are acquired at the SMIS (Spectroscopy and Microscopy in the Infrared using Synchrotron) beamline of the synchrotron SOLEIL (France).

We studied the distribution of the different phases (amorphous silicates hydrated and not, crystalline silicates, phyllosilicates, aliphatic organic moieties, calcium carbonate and sulfate) on both samples. Based on IR analyses, Paris fragment matrix presents a mixture of different and gradual stages of silicates amorphization/crystallization and hydration, consistent with the hydrothermal alteration scenario proposed by Leroux et al. [5]. Furthermore, the small particle analyzed shows several micro-environments corresponding to different degrees of aqueous alteration and suggests the following scenario: the more primitive part is mainly composed of small grains of olivine embedded in hydrated amorphous silicates. The aqueous alteration led, in the first stage, to the disappearance of olivine and enrichment of OH-bearing amorphous silicate. Finally, a higher degree of hydrothermal alteration led to the formation of phyllosilicates and carbonates. Besides, at a larger scale, infrared mapping gives an interesting glimpse on the way the fluid circulated into the matrix and partially altered it.

For the micrometric particle, IR measurements also reveal some local heterogeneity in the organic matter. Indeed, compared to the other parts of the grain, its most altered region is poorer in organics and characterized by a clearly higher CH_2/CH_3 ratio. This latter implies a higher elongation of the aliphatic chains or a lower degree of branching and/or cross-linking. We conclude that longer

aliphatic chains and/or a lower degree of ramification in this region are the result of the hydrothermal alteration.

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