EPSC Abstracts
Vol. 7 EPSC2012-367 2012
European Planetary Science Congress 2012

Micro-IR reflectance spectra of the Paris carbonaceous chondrite coupled to ToF-SIMS and micro-Raman spectroscopy

D. Baklouti (1), R. Brunetto (1), M. Noun (2,4), S. Della Negra (2), M. Pautrat (2), F. Jamme (3), C. Sandt (3), P. Dumas (3), B. Nsouli (4), M. Roumie (4), S. Merouane (1), L. d'Hendecourt (1) and E. Dartois (1).
(1) Institut d'Astrophysique Spatiale, CNRS, UMR 8617, Université Paris-Sud, 91405 Orsay Cedex, France, (2) Institut de Physique Nucléaire d'Orsay, UMR 8608, Université Paris Sud, 91406 Orsay Cedex, France, (3) Synchrotron SOLEIL, L'Orme des Merisiers, Saint-Aubin – BP 48, F-91192 Gif-sur-Yvette Cedex, France, (4) Lebanese Atomic Energy Commission, National Council for Scientific Research (LAEC/CNRSL), Airport Road, P.O. Box 11-8281, Beirut, Lebanon. (donia.baklouti@ias.u-psud.fr / Fax: +33169858675)

Abstract

We present the first micro-IR (1.5-15 µm) reflectance spectra of the Paris meteorite (a CM carbonaceous chondrite) [1,2,3]. Spectra are acquired at the SMIS (Spectroscopy and Microscopy in the Infrared using Synchrotron) beamline of the synchrotron SOLEIL (France), using a NicPlan microscope, coupled to a FTIR spectrometer operating in confocal reflection. A 500 µm wide area of a fragment (shown in Figure 1) of this meteorite was mapped with an IR spot ~20 µm. The region includes matrix and chondrules, and is chosen for its mineralogical and chemical diversity (essentially silicates, sulfates, carbonates, sulfides, and organic compounds).

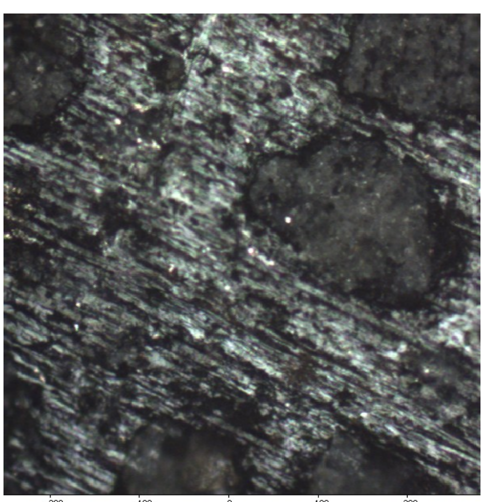

Figure 1: Optical image of Paris meteorite fragment analyzed by IR and Raman spectroscopy, and by ToF-SIMS. The scale is given in µm.

The IR identification of different mineral and carbonaceous components is supported by Raman micro-spectroscopy, performed at SOLEIL using a DXR Raman spectrometer from Thermo Fisher with a 532 nm exciting laser radiation, and a power on sample less than 0.3 mW (similarly to what described by [4]).

The IR and Raman analysis is complemented by an elemental and structural analysis by ToF-SIMS (time of flight secondary ion mass spectrometry coupled to imaging), using a bismuth beam (25 keV and 1.3 pA) at LAEC-CNRS (Lebanon). The mass spectrometry coupled to imaging mode allows the identification of components and their location. It provides the opportunity to map at the same time the mineral and the organic components. To avoid any problem of pollution and contamination during the sample manipulation we performed, before the experiments, a surface cleaning by bismuth beam sputtering.

Results will be discussed in the framework of the laboratory analyses in support of future sample-return mission to carbon-rich asteroids. Emphasis will be given on the advantages of coupling a typical remote sensing tool (IR spectroscopy) to high spatial resolution techniques (Raman and ToF-SIMS) that would be performed on possible collected asteroidal samples.

Acknowledgements

We thank the Museum d'Histoire Naturelle (France) for providing us with the meteorite fragment. The LAEC authors thank the IAEA (FS-LEB/11018 – TCLEB 2007) for support. This work has been supported by the National Agency for Research (France) under the program for future investment (reference ANR-10-EQPX-23) and by Université Paris-Sud grant "Attractivité 2012".

References

[1] Bourot-Denise, M., *et al*.: Paris: the slightly altered, slightly metamorphosed CM that bridges the gap between CMs and COs,41st LPSC, 2010.

[2] Blanchard, I., *et al*.: Paris: the slightly altered, slightly metamorphosed CM that bridges the gap between CMs and COs, 74th Met. Soc. Meeting, 2011.

[3] Merouane, S., *et al*.: micro-FTIR, micro-Raman Spectroscopies and SEM-EDX Analyses of Grains of the Paris Meteorite, 74th Met. Soc. Meeting, 2011.

[4] Brunetto, R., *et al*.: Mid-IR, Far-IR, Raman micro-spectroscopy, and FESEM-EDX study of IDP L2021C5: clues to its origin, Icarus, Vol. 212, pp. 896-910, 2011.