IN SITU SEDIMENTOLOGICAL STUDY OF THE CHEMICAL LITHOFACIES IN THE RIO TINTO AND JAROSO FLUVIAL SYSTEMS BY USING RAMAN SPECTROSCOPY. F. Rull[1,2], J. Martinez-Frias [1,2], Jesus Medina[1] and A. Sansano[1]. 1 Unidad Asociada UVA-CSIC al Centro de Astrobiología, Facultad de Ciencias, Universidad de Valladolid 47006 Valladolid (SPAIN), [2] Centro de Astrobiología, Carretera de Ajalvir Km4, 28850, Madrid (SPAIN) (rull@fmc.uva.es).

Introduction: Raman spectroscopy is a powerful technique for analysis of samples in either the solid, liquid or gas state without any preparation at the micro or macro scale. These capabilities are of great importance in the precise identification of mineral phases and their assemblages or in the identification of organic compounds. For these reasons Raman technique has been included as part of the Pasteur rover's payload in the Exomars mission. ExoMars is the first ESA flagship mission of the Aurora program that will send a rover to the surface of Mars in 2018 after the recent collaboration agreement NASA-ESA. The main aim of this mission is the search for past and present life on Mars. As part of this main aim to characterise the mineral products and indicators of biologic activities and to characterize mineral phases produced by water-related processes are of prime importance.

On Earth, fluvial environments are complex and dynamic systems which are conditioned by a considerable set of factors: climate, hydrology, geotectonic setting, rocks and soils, and also biodiversity. In this general framework, fluid-material interactions, involving clastic and chemical sediments, play a particular, but essential, role in the spatial-temporal architecture and evolution, at different scales, of the types of surface streams. Thus, in the context of Mars exploration, and considering the geomorphological and sedimentological features of the selected landing sites [1], it is important to examine specific sedimentary facies controls on the distribution of fluvial cementation, compaction and ratios of mineralization/alteration due to hydration-dehydration processes. The Tinto river and Jaroso ravine (Spain) are two extremely interesting fluvial stream systems, with and without water respectively, which have been proposed as potential Earth analogs [2,3] for the geological and astrobiological exploration of Mars. In the present work a comparative study of the chemical lithofacies in both environments has been performed at in the field and in the laboratory.

Experimental Raman spectra at the field were performed in-situ without any sample preparation at different places of the Rio Tinto area. The Raman spectrometer used was a portable i-Raman from *B&W TEC Inc*. adapted to work in field conditions. The optical head was attached to a mechanical device simulating the rover's arm to approach the samples with accuracy and stability. A baffle was used at the end of the optical head to minimize the solar light background. The excitation used was a 532nm wavelength laser with about 15mW power on the sample and a spot diameter of 100μm. Spectral resolution was ~5cm-1. Samples at the laboratory were analyzed with a portable Raman spectrometer developed in our group with the same spectral characteristics of the Raman Exomars instrument and coupled to a Raman optical head installed in a microscope stage.

Results In Figure 1 and 2 the Raman optical head taking in-situ spectra in evaporite samples at the Rio Tinto source and at the Jaroso Ravine are depicted with some of the spectra obtained. Results from the field and laboratory are analyzed and discussed in the framework of the different mineral formation processes at the two sites.

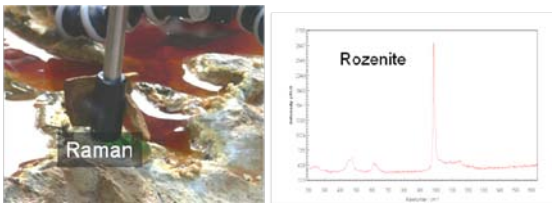

Figure 1. In-situ Raman analysis of evaporite minerals at Rio Tinto. Pure Rozenite is identified

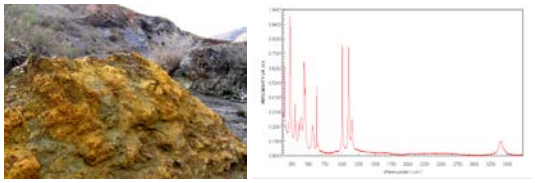

Figure 2. Massive deposit of Jarosite at Jaroso Ravine (World locality type of Jarosite) and Raman spectrum obtained

References:

[1]http://marsoweb.nas.nasa.gov/landingsites/index.html

[2] Fernández-Remolar et al. (2004) *Planetary and Space Science* 52: 239-248

[3] Martinez-Frias et al. (2004) *Earth, Planets Space* 56: 5-8.

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