Deep-UV laser-induced breakdown spectrometry and laser-ionization mass spectrometry for astrochemistry studies.

J.M. Vadillo, J. Moros, J.J. Laserna

[1] *UMALASERLAB, Universidad de Málaga, Jimenez Fraud 3, 29010, Málaga, España-Spain*

[a)] Corresponding author: jmvadillo@uma.es

The recent ambitions of different national space agencies to return to the Moon and to potentially set up a permanent moon base soon, have triggered the interest to adapt different analysis techniques to the conditions of our satellite. The Moon has virtually no atmosphere, with a vacuum level in the range of the pico mbar. Under such conditions, and after the formation of a laser-induced plasma, the possibility of direct recording of LIBS spectra below 200 nm (DUV/VUV LIBS) or performing mass spectrometry out of the generated ions (LIMS) can be done without the use of pumping system.

This communication will show the results obtained in the laboratory under ultra-high vacuum conditions monitoring the photons and ions of solid samples of interest in astrochemical research. For LIBS, a flat-field XUV spectrometer was used, with capability to cover a spectral range from 30-250 nm. Such region, very unexplored in conventional LIBS offers several advantages as reduced interferences and a higher emission intensity from elements of interest in astrochemistry as CHNOPS. For LIMS, a reflectron-type time-of-flight mass spectrometer was used, allowing the simultaneous recording of mass spectra in the 1-1000 range.

A deep discussion on the two experimental configurations will be provided, detailing the experimental parameters affecting the signal in both cases. Different examples will be shown, with special emphasis in non-consolidated matter that can be assimilated to the moon regoliths.