Paper ID: 44328
interactive
student

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Astrobiology and Exploration (6)

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OREOCUBE (ORGANICS EXPOSURE IN ORBIT): IN-SITU UV-VIS SPECTROSCOPY OF ORGANIC COMPOUNDS ON THE INTERNATIONAL SPACE STATION

Abstract

OREOcube is a next generation exposure platform with *in-situ* spectroscopic instrumentation, to be placed on the exterior of the International Space Station (ISS). OREOcube is part of a new European space exposure facility, which is currently under development by the European Space Agency. The anticipated launch is scheduled for 2020.

The scientific focus of OREOcube is to study the carbon chemistry of astrobiologically interesting compounds directly in space. This avoids the limitations and technical challenges of laboratory simulation experiments on ground. Via *in-situ* UV-Vis spectroscopy, photochemical changes of organic/inorganic dual layer thin films will be monitored for a duration up to 18 months. Afterwards, samples will return to Earth

for further in-depth chemical analysis. With each specific experiment on the OREOcube platform, we aim to understand the photostability of potential biomarkers and the formation of decomposition products. Furthermore, we will investigate the role minerals and inorganic surfaces play in these photochemical decomposition processes.

Currently pre-flight experiments are being performed in order to select and test flight candidates. As a subset, we will show ground simulation results of organic molecules belonging to the class of porphyrins, quinones and amino acids, important molecules found in terrestrial organisms. Thin films of organic molecules will be in contact with iron oxide and mineral surfaces during irradiation, simulating a Mars-soil environment. The organic/inorganic composite films will be hermetically sealed within a so-called sample cell, which can be filled with gas at various pressures simulating Martian atmospheric conditions. Upon irradiation in the laboratory with simulated solar light, photochemical changes of the organics will be monitored and analysed via UV-Vis spectroscopy. By measuring *in-situ* the changes in the UV-Vis spectra of samples as a function of time, OREOcube will provide data sets that capture critical kinetic and mechanistic details of sample reactions that are not obtainable with the current exposure facilities on the ISS.