OREOcube: ORganics Exposure in Orbit R. Quinn[1], A. Elsaesser[2], K. Bryson[1], K. Bywaters[3], P. Ehrenfreund[2], A. Mattioda[3], A. Ricco[3], F. Salama[3] and O. Santos[3] [1]SETI Institute, Mountain View, CA USA (Richard.C.Quinn@nasa.gov), [2]Leiden Institute of Chemistry, Leiden University, NL, [3]NASA Ames Research Center, Moffett Field, CA USA

Introduction: The ORganics Exposure in Orbit (OREOcube) experiment is designed to measure chemical changes in organic samples in contact with inorganic substrates to investigate the role solid mineral surfaces may play in the (photo)chemical evolution and distribution of organics in the interstellar medium, comets, meteorites, and other bodies. Currently under development in preparation for a 12-month deployment on an International Space Station (ISS) external platform, OREOcube uses UV/visible/near-IR spectroscopy for in situ sample measurement. Based on technology developed by NASA Ames Research Center's Small Spacecraft Payloads and Technologies Team, OREOcube is comprised of two 10-cm cubes each containing a highly capable spectrometer for the monitoring of samples held in a 24-sample cell carrier. Each cube is an autonomous stand-alone instrument package, requiring only a power and-data interface, with integrated electronics, a microcontroller, data storage, and optics to enable the use of the Sun for photochemical studies (124 to 2600 nm) and as a light source for spectroscopy (Fig. 1).

The OREOcube experiment: Results from ground control experiments that have been performed in preparation for the ISS flight experiment will be reported. In an OREOcube experiment, an adsorbate-substrate interface is defined by depositing organic samples as thin films onto solid substrates. Samples are housed in hermetically sealed reaction cells containing an internal test environment that allows control of headspace gases including the partial pressure of water vapor (Fig. 2). This provides a controlled method to examine organic samples and inorganic surface interactions.

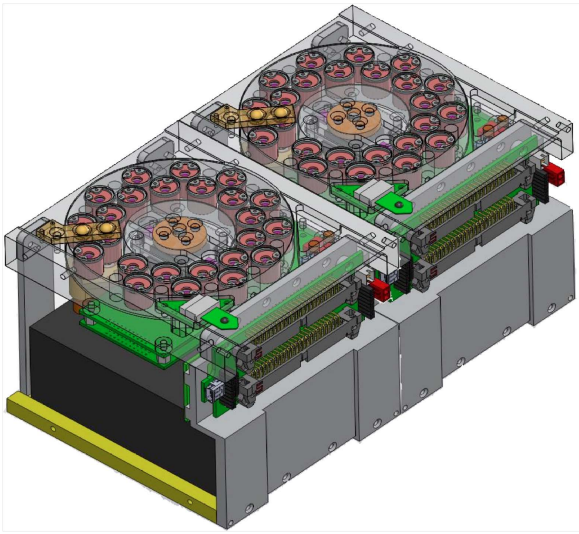

Fig. 1. OREOcube payload. Two independent 10-cm cubes each containing a 24-sample cell carrier and an integrated UV/Vis/NIR spectrometer are used to measure changes in organic compounds exposed to low Earth orbit radiation conditions on an ISS external platform.

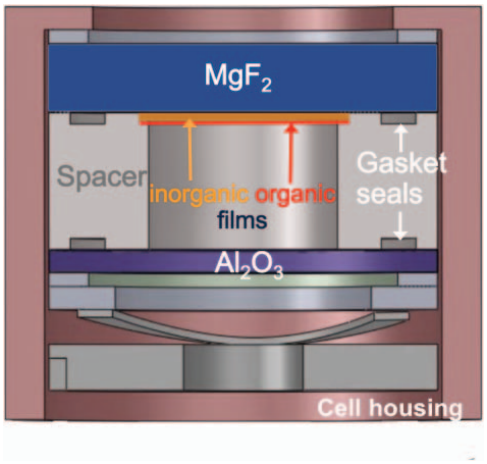

Fig. 2. OREOcube reaction cells. Inorganic and organic thin-film samples are deposited on an optical window and hermetically sealed in a sample cell containing a controlled headspace gas(es). Sample are exposed to direct Sun light, on an external ISS platform, through the top of the cell. The Sun is also used as a light source for spectroscopy (measured using collection optics positioned at the bottom of the cell).

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