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247th ACS National Meeting, Dallas, TX

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Symposium Title: (PHYS008) Chemistry in the Interstellar Medium

INSTITUTIONS

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2. SETI Institute, Mountain View, C, United States
3. Leiden University, Leiden, The Netherlands
4. Space Policy Institute, Washington, D.C., United States
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Title: Organism/Organic Exposure to Orbital Stresses (O/OREOS) Satellite: Radiation Exposure in LEO and Supporting Laboratory Studies

Abstract Body: We will present the results from the exposure of the metalloporphyrin iron tetraphenylporphyrin chloride (FeTPPCI), anthrarufin ($C_{14}H_8O_4$) (Anth) and Isoviolanthrene ($C_{34}H_{18}$) (IVA) to the outer space environment, measured *in situ* aboard the Organism/Organic Exposure to Orbital Stresses nanosatellite. The compounds were exposed for a period of 17 months (3700 hours of direct solar exposure) including broad-spectrum solar radiation (~122 nm to the near infrared). The organic films are enclosed in hermetically sealed sample cells that contain one of four astrobiologically relevant microenvironments. Transmission spectra (200–1000 nm) were recorded for each film, at first daily and subsequently every 15 days, along with a solar spectrum and the dark response of the detector array. In addition to analysis via UV-Vis spectroscopy, the laboratory controls were also monitored via infrared and far-UV spectroscopy. The results presented will include the finding that the FeTPPCI and IVA organic films in contact with a humid headspace gas (0.8–2.3%) exhibit faster degradation times, upon irradiation, in comparison with identical films under dry headspace gases, whereas the Anth thin film exhibited a higher degree of photostability. In the companion laboratory experiments, simulated solar exposure of FeTPPCI films in contact with either Ar or $CO_2:O_2:Ar$ (10:0.01:1000) headspace gas results in growth of a band in the films' infrared spectra at 1961 cm^{-1} . Our assignment of this new spectral feature and the corresponding rationale will be presented. The relevance of O/OREOS findings to planetary science, biomarker research, and the photostability of organic materials in astrobiologically relevant environments will also be discussed.

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