IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Interactive Presentations - IAF MATERIALS AND STRUCTURES SYMPOSIUM (IP)

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CORROSION CHEMICAL KINETICS AND EROSION EFFECTS DUE TO ATOMIC OXYGEN EXPOSURE OF SOLAR ARRAYS FOR NANO-SATELLITES APPLICATIONS.

Abstract

In recent years the diffusion of nano-satellites is exponentially increasing. Although the operative life of such small satellites is still not highly long-lasting, at present day, the power supplies and internal subsystems technology improvement is rapidly increasing. It is so can be foreseen that will be an increasing of operative life up to several years in the next future. In this frame the study of Atomic Oxygen effects on vital subsystems as solar arrays, is of primary importance. In fact the 96Two kind of experimental analyses have been carried out, setting the Atomic Oxygen generator at a fluence of 1.5E21 atoms/cm2, for a time of exposure of 1000 equivalent sun hours. First of all, the erosive mechanical effect of Atomic Oxygen has been studied, evaluating the erosion rate. Secondly, the growth of potentially dangerous oxides due to the exposure to Atomic Oxygen have been evaluated, studying the chemical kinetics that rules creation, growth and stabilization of the oxides on the solar arrays surface. To evaluate the mechanical erosions and the amount of oxygen grown on the surface of the photo-electroactive materials, scanning electron microscopy (SEM) technique coupled with dual energy dispersive spectroscopy (dEDS) detectors has been involved for surface morphological observations correlated to the surface chemical identification. The morphology investigations will be able to determine dimensionally the micron-fractures and their amount on the degraded surface. Furthermore, the EDS analyses will establish quantitatively the amount of oxygen distributed on the observed surface through bi-dimensional chemical mapping in order to understand the degradation mechanisms for improving the efficient energy conversion devices. The experimental results will be compared with data collected from orbiting nanosatellites, since the Space System and Space Surveillance Lab of Sapienza University of Rome has an orbiting cubesat operative since June 2017 and

a new satellite (1kuns –PF) will be launched in March 2018. The telemetry data achieved from these mission will permit to validate laboratory test campaign results.