Paper ID: 79920
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IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Environmental Effects and Spacecraft Protection (6)

Author: Mr. Robin Drevet
Department of Space Engineering, Lulea University of Technology, Sweden

Dr. Vitali Braun
IMS Space Consultancy, Germany
Mrs. Margot Clauss
Luleå University of Technology, Sweden
Prof. Rene Laufer
Luleå University of Technology, Sweden

AGEING PROCESS ANALYSIS OF SOLAR PANELS IN GRAVEYARD GEO ORBIT FOR REUSABILITY POTENTIAL

Abstract

The constant growth of space debris and the associated risks force the space community to find solutions to mitigate them. Today the most advanced solutions to dispose of satellites and rocket stages after the end of mission consists of moving them either into a graveyard orbit or towards an atmospheric re-entry ending in the demise of both spacecraft and its materials. Alternative solutions should be considered, such as providing a sustainable solution by reusing materials in space.

However, it is crucial to understand better the ageing process of the materials present in currently active spacecraft and space debris. The space environment causes degradation and damage over time, making the state of those materials uncertain for potential re-use. Degradation effects have been studied as a source mechanism to result in paint flakes, ejecta particles, or delaminated insulation foils released into the space environment and sustaining a positive feedback loop through potential impacts into spacecraft. A better understanding of degradation effects would also help to better characterize the small debris environment and its evolution. The current materials databases used by the space industry could be useful tools to select materials for satellite missions with respect to their reusability, but they often do not include the evolution of material properties in space after the end of mission.

This study will investigate the impact of the space environment on selected materials and components, such as solar panels, by augmenting the existing materials databases to include the ageing process and the reusability potential of the selected components. Together with the development of software that reflects on the current (and projected for the short-term) state of the spacecraft and materials in space, the materials are organised depending on their ageing process to characterize and evaluate their reusability potential.