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Author: Dr. Susanna Laurenzi
Sapienza Università di Roma, Italy, susanna.laurenzi@uniroma1.it

Mr. Matteo Sirilli
Sapienza University of Rome, Italy, matteo.sirilli@gmail.com
Dr. Marta Albano
Sapienza University of Rome, Italy, marta.albano@uniroma1.it
Prof. Mario Marchetti
Associazione Italiana di Aeronautica e Astronautica (AIDAA), Italy, mario.marchetti@uniroma1.it

OUTGASSING IN CARBON NANOSTRUCTURED FILMS ON MYLAR SUBSTRATE

Abstract

Carbon-based nanostructured films can improve the performance of flexible membranes, which are the primary elements of several aerospace subsystems. Flexible membranes are widely used especially when it is required to combine lightweight with specific optical properties and thermal resistance. Typical applications are multi layers insulation (MLI) for external spacecraft surfaces and membranes for solar sails. It is a known that MLI causes unwanted interference and passive intermodulation products problems due to its high radio frequency reflectivity in the specular direction. In order to overcome these problems, we develop selective absorbing layers of carbon-coated films on polymer substrate by controlling the carbon nanotubes (CNTs) concentration. The large surface of MLI is a significant outgassing source, jeopardizing the physical properties of the membranes and creating contaminating clouds around the spacecraft that compromise its sensors functionality. In this work, we present the manufacturing assessment of nanostructured multilayered films on Mylar substrate and the experiments campaign to study the outgassing phenomenon associated with them. We deposit carbon nanotubes at different mass percentage on polyester substrates (Mylar) using the spin-coating technique. Performances of the nanostructured film is thickness and homogeneity dependent; we fabricate films with a good compromise among different manufacturing aspects, including film morphology, adhesion, and film flexibility. Finally, the nanostructured multilayered film on Mylar substrate are tested according to ASTM E595 and ECSS Q70-02A standards.