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# UV-C EFFECTS ON CARBON NANOSTRUCTURED FILMS FABRICATED ON MYLAR SUBSTRATE

**Abstract**

Flexible membranes are the basic elements of different spacecraft subsystems, such as thermal blankets in satellites and propulsion systems in solar sails. One of the major technical challenges for a spacecraft engineer is to maintain different equipment working in different bands uncontaminated by neighboring antennas, feeds and the thermal hardware such as the multi-layer insulation (MLI). It is a known fact that MLI causes unwanted interference and even passive intermodulation products problems due to its high radio frequency (RF) reflectivity in the specular direction. On the other hand, solar phonon sailing is expected to be a revolution in space propulsion, as a continuous low-thrust propellant-less thrusting mode that can act for any mission time length. For these applications, the membrane general performance, at both optical and electromagnetic level, can be improved by coating the membranes with carbon nanoparticles. However, polymer-based materials in space exhibit larger degradation effects due to the combination of energetic UV radiations, vacuum, atomic oxygen, as well as large temperature gradients, which generate thermal stresses inside the structures. In this work, we investigated the effects of UV-C radiations on carbon nanostructured films realized on Mylar substrate. The carbon nanostructured films were fabricated at different nanoparticle loadings using spin coating and spraying processes. The film deposition process was optimized based on the results from electrical conductivity measurements. The specimens were irradiated with different UV-C doses, and their surface modification was studied in terms of morphology, wettability and electrical properties. In particular, scanning electron microscopy (SEM) and contact angle analysis were performed on untreated and irradiated samples, and showed the different effects of highly energetic UV-C radiation on several types of films.