Low Secondary Electron Emission 2D Materials for Space Electronics Applications

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In the field of electronics for space, especially regarding communication, earth observation, navigation and electronic intelligence satellites, RF passive devices such as circulators, filters, and isolators are being revolutionized by innovative materials and advanced surface physics concepts. These advancements not only raise the multipactor threshold but also provide new insights into spectroscopy and material structure. This study presents recent progress in the development of emerging low Secondary Electron Emission Yield (SEY) coatings and 2D materials with unique electronic and thermal properties. Novel methods for creating nano-microstructured silver coatings for aluminum alloys and dielectrics have been explored, achieving a maximum SEY of less than 1.. The unexpected behavior of SEY on coatings combining conductive (silver) and dielectric (alumina, Kapton, and PEEK) surface regions is also investigated. To assess SEY as a function of primary energy, both pulsed and continuous measurement techniques were utilized. The dynamic evolution of SEY in similar samples at a fixed primary electron energy was also examined, proposing a charging-roughness coupled model to simulate the experimental results.

Keywords: SEY, 2D materials, RF breakdown, electroless treatments.

Acknowledgements: This work was supported by the Ministry of Science and Innovation of Spain, MCIN/AEI/10.13039/501100011033 through the Spanish Project PID2021-122761OB-I00 and the ESA (European Space Agency).

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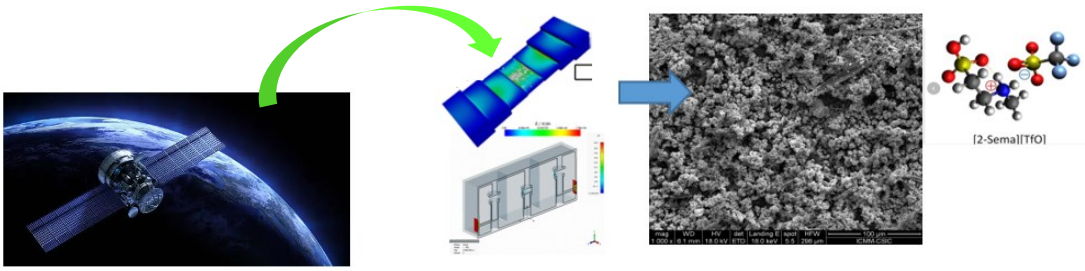

Figure 1. Electroless silver plating for GNSS systems: (left) satellite in orbit, (middle) RF filter highlighting regions susceptible to multipactor that need protection, (right) scanning electron microscopy (SEM) image of the cross-section of an electroless silver coating on Al and the molecular structure of ionic liquids