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Introduction: Space Environmental Effects on Materials

WE are pleased to bring you a selection of papers in this special section of the *Journal of Spacecraft and Rockets*. Most of these papers were originally presented at the 6th International Conference on Protection of Materials and Structures from Space Environment (ICPMSE-6). The papers describe the deleterious effects of the space environment on spacecraft and document these effects that occur during both on-orbit tests and ground-based exposures. This special edition is composed of papers with international authorship that all strive to address a common objective, to understand the effects of space environment interaction with spacecraft materials, which will enable optimum performance of spacecraft and help ensure mission success. The complete set of papers presented at the ICPMSE-6 can be obtained from Kluwer Publishing in the Proceedings of the ICPMSE-6. We appreciate Kluwer Publishing's granting permission to publish this special edition of selected papers from the ICPMSE-6.

The study of the effects of the space environment is, at least, a challenging one. Space, considered by some to be a benign vacuum, is in actuality a harsh environment that subtly degrades the engineering properties of spacecraft materials and, if left unattended, can prematurely terminate mission objectives. The space environment is composed of, but not limited to, atomic oxygen in low Earth orbit, electrons, protons, energetic heavy ions, plasma, ultraviolet radiation, micrometeoroids, orbital debris, spacecraft-induced contamination, and thermal cycling. These elements of the space environment interact, simultaneously, with the spacecraft and will produce a "synergistic" effect that alters the engineering performance of spacecraft materials.

The aerospace community has for decades studied the effects of the space environment on spacecraft materials through both flight experiments and ground-based laboratory testing. The challenge has been and remains to accurately simulate the effects of the space environment in a ground-based test. To add to the complexity of spacecraft design, materials are constantly undergoing changing formulations and processes, which alter the effects of the space environment on the engineering performance of the material. In addition, new materials for spacecraft application are being developed that require testing to determine the operational lifetime in the space environment. The papers presented in this special section describe the effects of the space environment on specific spacecraft materials. It is the intent of this publication to shed light on the importance of understanding the effects of the space environment on the engineering performance of materials and offer guidance on the application of mitigation techniques.

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