Abstract

The Utah State University SUStECS project was a unique student experiment that allowed for pre- and post-flight analysis of various materials used in space-component design. Approximately 180 material samples were flown on MISSE-6 and spent 18 months suspended off the side of the International Space Station, which were returned in pristine condition. This presentation focuses on the most intriguing sample, a thin film of polyethylene terephthalate (PET) Mylar™ coated with Vapor Deposited Aluminum (VDA). Samples that were part of the Materials International Space Station Experiment (MISSE) experienced diverse effects whilst exposed to the space environment. This sample in particular, displayed evidence of atomic oxygen erosion of the VDA, UV-induced discoloration of the polymer, and a crater created by a micrometeoroid impact. Despite micrometeoroids being a common occurrence, there is a significant lack of data pertaining to the effects of micrometeoroids on space components. In order to further understand these effects, a simulation of the UV radiation was tested on similar polymers at varying intensities. Careful inspection of the micrometeoroid impact crater allowed estimation of the likelihood of such an impact and creation of a model of its detrimental effects. Vaporization energy calculations were used to estimate the pre-impact velocity and mass of the micrometeoroid, as well as the trajectory of the impact ejecta and its effects on surrounding material. It is of particular interest to note that VDA-coated Mylar™ is a major component in the construction of astronaut suits, which could be penetrated by such micrometeoroid impacts. *This work was supported through funding from NASA and Johns Hopkins.