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Radiation Fields, Effects and Risks in Human Space Missions (5)

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EXPERIMENTAL ANALYSIS OF H-BNNT/SIC/GRAPHENE/EPOXY WITH PHENOLIC RESIN FOR COTS AND SPACESUIT MATERIALS

Abstract

The risk of radiation effects on commercial electronics (COTS) in space systems, which can severely degrade reliability and performance, is assessed in this study using a novel methodology. The author addresses a multifunctional substance for shielding galactic cosmic rays (GCR) and solar event particles (SEP) from electrical, electronic and electromechanical (EEE) components. Avoiding risk factors for astronauts wearing spacesuits during scientific activities in space is a higher priority than usual. The proposed material (boron nitride nanotubes or BNNTs), unlike carbon nanotubes (CNTs), has a broadband gap, is piezoelectric, can shield against neutron radiation and resists decomposition up to 1000C. Nonetheless, major scientific obstacles to the development/manufacture of space suits and EEE components are being addressed. BNNTs could be the next big step for sophisticated nanocomposite applications in space. This study explores the value of state-of-the-art material characteristics for BNNTs, including physical, chemical and multi-step processes, and their applications. The structural integrity of the composites was evaluated using XRD, EDX, SEM, Raman analysis, Brinell and impact testing. The test results show that BNNT with additional fillers can withstand heat in all orbital regions while blocking radiation. There are also no risks in using the material as a layer in the spacesuit.