

Fabrication of Nanoengineered Radiation Shielding Multifunctional Polymeric Sandwich Composites

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Abstract : Space Radiation has become one of the major factors in successful long duration space exploration. Exposure to space radiation not only can affect the health of astronauts but also can disrupt or damage materials and electronics. Hazards to materials include degradation of properties, such as, modulus, strength, or glass transition temperature. Electronics may experience single event effects, gate rupture, burnout of field effect transistors and noise. Presently aluminum is the major component in most of the space structures due to its lightweight and good structural properties. However, aluminum is ineffective at blocking space radiation. Therefore, most of the past research involved studying at polymers which contain large amounts of hydrogen. Again, these materials are not structural materials and would require large amounts of material to achieve the structural properties needed. One of the materials to alleviate this problem is polymeric composite materials, which has good structural properties and use polymers that contained large amounts of hydrogen. This paper presents steps involved in fabrication of multi-functional hybrid sandwich panels that can provide beneficial radiation shielding as well as structural strength. Multifunctional hybrid sandwich panels were manufactured using vacuum assisted resin transfer molding process and were subjected to radiation treatment. Study indicates that various nanoparticles including Boron Nano powder, Boron Carbide and Gadolinium nanoparticles can be successfully used to block the space radiation without sacrificing the structural integrity.

Keywords : multi-functional, polymer composites, radiation shielding, sandwich composites

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