

NANOCOMPOSITES FOR SPACE APPLICATIONS

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Abstract

The drive to lower the cost of space launches has resulted in the use of polymer matrix composites with micro reinforcements such as carbon fibers. Further attempts to decrease the weight of spacecraft and to improve the performance have led to the addition of nano reinforcements to these composites. In this paper, the application of nanocomposites in spacecraft structures is reviewed. First, several nano reinforcements, such as graphene, fullerene, nanotubes, nanofibers, nanoclays and Polyhedral Oligomeric Silsesquioxane (POSS), are briefly reviewed. Then the stringent requirements of the space environment, in relation to material properties, are reviewed. The space environment poses several challenges such as ultraviolet radiation, temperature extremes, thermal cycling, charged particle radiation, impacts from micrometeoroids and orbital debris, and low earth orbital atomic oxygen. Next, the testing of candidate materials in actual space environment and at ground based testing facilities is reviewed. This is followed by specific applications of nanocomposites in space structures.

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