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MULTIFUNCTIONAL NANO-STRUCTURED INTERLAYERED POLYMERIC COMPOSITE MATERIALS

Abstract

Carbon fiber reinforced polymeric matrices in the form of layered structures have become an important structural material and process class used in aerospace field. Nevertheless, both from a manufacturing as well as an analysis point of view, lamination processing is expected to supply an apparently homogeneous structure with uniform stress distribution through the thickness of the material. This work presents the concept of a multifunctional material that integrates nano-technologies in the interlayer utilized as enablers for structural composites while also improving through-thickness properties of the composite laminates. These interlayers aim to enhance both manufacturing and performance characteristics of laminated polymer composites. The appropriate implementation of the laminates can be assured through impregnation methods that have been developed and tested in Polymeric Composites Laboratory [2]. Specifically, developed technologies such as carbon nanotubes grown in the z-axis [3, 4], internally reinforced nano-foamed epoxies [1], and others as well as their combinations can be the base material of a well-integrated multifunctional interlayer resulting to an enhanced structural polymer composite. Carbon nanotubes can assure higher toughness and impact strength, while the controlled nano-foamed epoxies are able to reduce the overall weight, but most importantly to prevent crack propagation. Eventually, this effort presents a multifunctional material that can solve weaknesses and potential difficulties that are common in conventional polymer composite aerospace structures.

References:

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