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The Global Market for Nanotechnology in Aerospace

https://marketpublishers.com/r/G6732524309EN.html
Date: January 2017
Pages: 52
Price: US$ 616.00 (Single User License)
ID: G6732524309EN

Abstracts

Technology innovation in aerospace is increasingly focused on creating products to reduce costs (e.g. fuel efficiency, maintenance, and repair), and increase safety and comfort. A major trend is creating multi-functional composite materials to carry out tasks generally performed by several elements.

The embedding of carbon-based nanomaterials, such as CNTs and more recently graphene nanoplatelets, has been investigated as a possible solution for a large number of challenges related to aerospace structures.

Nanomaterials are utilised in the aerospace industry for improved (or tailored) properties that improve their functional performance (e.g. mechanical or electrical properties) or that deliver multi-functional properties (e.g. lightweight conductive nanocomposites).

The bulk of R&D into aerospace applications of nanotechnology and nanomaterials at present focuses on structural reinforcement of composite materials. Nanomaterials will potentially allow for the development of lighter, high-performance, robust and cost-efficient, multi-functional aircraft.

Nanomaterials have the potential to outperform carbon fiber, imparting significantly improved structural, protective and functional properties. Using nanomaterials either as a strengthening ply with polymer matrix type laminates or as a fiber in traditional composite systems, shows enormous potential in aerospace applications. This would lead to fuel savings, cutting costs for airlines and passengers and reducing carbon emissions.

CNTs have been incorporated into the NASA Juno spacecraft and other aerospace component applications. Nanocomp Technologies CNT sheet, EMSHIELD, was incorporated as a surface layer on several critical components of the Juno spacecraft,

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launched in August 2011, to provide protection against electrostatic discharge (ESD).

Coatings are generally used in the aerospace industry for protecting the structures and surfaces of the aircraft from harsh environments. In aerospace applications, nanocoatings have been developed for:

§ Improving the life span, reliability and durability of components.

§ Self-cleaning.

§ Erosion, sliding and wear resistance.

§ Anti-fouling.

§ Improving surface quality.

§ De-icing.

§ Improved thermal performance and flame retardancy.

§ Corrosion resistance against pitting, peeling, oxidation and heat.

Nanocoatings reduce maintenance, decrease life cycle costs, and increase readiness by limiting equipment downtime through exhibiting considerably more protection than conventional coatings. A number of aerospace companies and agencies are developing CNTS and graphene coatings to add special characteristics to aircraft frames and interior and engine parts and component surfaces.

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