A NOVEL RADIATION SHIELDING NANO-COMPOSITE MATERIAL FOR SPACE EXPLORATION.

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The severe environment in space challenges material scientists and engineers which provides opportunity for development of novel composite materials. Spacecrafts experience large thermal gradient and ionizing radiations, electromagnetic interference, electrostatic discharge, and impulsive loading caused by hypervelocity impacts of micrometeoroids or manmade space debris. Furthermore, the containment of radioactive materials utilized on deep space flights in the case of a potential accident creates additional environmental and safety requirements for the development of robust and reliable space materials. Therefore, high performance engineered composite materials with stringent safety specific thermal and mechanical properties are critical to the safe and successful human exploration of space.

Although, nanomaterials have found broad applications in the exploration of space however, the emerging new generation of carbon nanoparticles doped with neutron absorbing clusters (for example, Boron Carbide) is not well characterized. An experimental approach to design and develop nanostructured materials is one of the pivotal challenges facing the nanotechnology and modern space materials science. The ability to control material properties at the nano-size level by using nanoparticles in order to create arrays, patterns and networks, is an important requirement in fabricating new multi-functional nanomaterials. A utilization of the magnetic field in manufacturing nanomaterials is a quite new and has the promise of broadest applications. This method is quite effective in controlling of macro- and micro-structures of synthesized materials with unique properties.

This paper presents the preliminary results on the characterization of the newly developed carbon nanoparticles doped with clusters and synthesized via a novel technology. We will show based on the obtained results the possibility of using nanocomposite as a high radiation shielding material for spacecrafts, which is the subject of the Phase-II of this research project.