

POSS® Materials Show Significantly Better Space Survivability Over Currently Used Polymers

Hattiesburg, MS: The Air Force Research Laboratory (AFRL) is fabricating a survivable, drop-in POSS® polymer replacement for the ubiquitous but short-lived Kapton® material that many space components currently utilize. Funding for the effort is provided by the United States Air Force and the Defense Advanced Research Projects Agency (DARPA). Kapton®, a polyimide, degrades because spacecraft surfaces in low Earth orbit must endure high Atomic Oxygen (AO) flux, bombardment by charged particles and thermal cycling along the full spectrum of solar radiation.

The Air Force states that “POSS® polymers may soon replace Kapton® for all military and commercial space applications.” Hybrid Plastics™ is partnering with the Air Force in developing POSS® technology for this and other space applications. The AFRL flew several POSS® based polymer samples, including POSS® Kapton® polyimides on the International Space Station for nearly 4 years as part of the Materials International Space Station Experiment (MISSE). Testing of polymers containing POSS® reveal that they are radiation insensitive and provide at least a ten (10) fold improvement in the AO erosion rate over existing Kapton® polymers. This order of magnitude change will enable the development of a new generation of novel space survivable materials.



*Astronaut installing one the Passive Experiment Containers containing POSS® Nanocomposites onto the International Space Station during STS-105. *Courtesy U.S. Air Force*

POSS® [Polyhedral Oligomeric Silsesquioxanes] is a revolutionary new Nanotechnology based on silicon-derived building blocks that provide nanometer-scale control to dramatically improve the thermal and mechanical properties of traditional polymers while offering easy incorporation using existing manufacturing protocols. These compounds have an average diameter of just 1.5 nanometers, or billionth of a meter. POSS® nanomaterials can be used both as direct replacements for hydrocarbon based materials or as low-density performance additives to traditional plastics. They release no VOCs, and, thereby, produce no odor or air pollution. They are biocompatible, recyclable, non-flammable, and competitively priced with traditional polymer feedstocks. POSS® Nanostructured® materials can be readily incorporated into virtually any existing polymer system through blending, grafting or copolymerization.

These POSS[®] nanobuilding-blocks were hailed by R&D magazine as one of the 100 most technologically significant new products globally for the year 2000. Hybrid Plastics was one of five finalists for the Small Times Magazine's *2002 Best of Small Tech Award* for its POSS[®] Nanostructured[®] materials. The Small Times Magazine Best of Small Tech Awards recognize globally the best people, products and companies in nanotechnology, MEMS and microsystems.

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