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Science and Technology for Tomorrow's Air and Space Force

Success Story

EDWARDS RESEARCH SITE EVOLVES NEW CLASS OF FLUORINATED POSS POLYMERS

Researchers at the Propulsion Directorate's Edwards Research Site are helping meet the Air Force's demand for a new generation of lightweight, high-performance polymeric material. The research led to the development and large-scale production of the first new polymer feedstocks in the past 40 years. For the past decade, the Edwards Research Site pursued the development of new chemical feedstock technologies based on polyhedral oligomeric silsesquioxanes (POSS).

Because of its chemical nature, POSS technology is easily incorporated into common plastics via copolymerization, or blending, and requires little or no alteration to existing manufacturing processes. POSS additives radically upgrade the thermal and physical properties of most plastics.

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Accomplishment

A new class of POSS compounds evolved from research at Edwards Space and Missile Propulsion research facilities. These compounds are fluorinated and have the highest molecular weight yet produced in POSS research. Fluoroalkyl and fluoroaryl POSS compounds have the potential to blend with various fluoropolymers used in spacecraft coatings and low-creep seals.

POSS-enhanced plastic polymers allow users to produce products with capabilities not previously possible. The POSS technology-derived polymers are revolutionary in their ability to mimic ceramic class attributes.

In addition to their greater strength and space-survivable features, they may also demonstrate abrasion resistance. As additives, POSS may be useable in heat-abrasion-resistant paints, coatings, and fire retardants. In plastics, POSS is useable in medical materials, space-resistant resins, packaging/coatings, resins, and elastomers.

Background

POSS research at the Edwards facilities is a rapidly evolving area of dual-use technology development that provides innovative plastic polymer materials to military and industrial users. The plastics industry is interested in POSS research, and *R&D Magazine* recognized POSS as one of the top 100 most significant products for 2000. The nanotechnology publication, *Small Times Magazine,* recently selected the directorate's POSS spin-off company, Hybrid Plastics, as one of five finalists for their 2002 Best of Small Tech Award.

Propulsion
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Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-PR-14)