Image credit: NASA

National Aeronautics and Space Administration

Materials and Coatings

# Puncture-healing Engineered Polymer Blends

## Several puncture healing engineered melt formulations, consisting of a non-healing and a self-healing polymer

NASA inventors have developed a set of puncture self-healing materials comprised of commercially available, known self-healing polymer resin and additive blends. A range of puncture healing blends was developed by melt blending self-healing polymers with non-self-healing polymeric materials.

## BENEFITS

- Puncture healing capability of the melt blends improves at higher temperatures
- Thermoplastic materials that can repeatedly and intrinsically self-heal without the need for foreign inserts or fillers (such as microencapsulated monomer)
- Blend of self-healing polymer materials with high strength polymer resins potentially enables the materials to be used in structural, load bearing applications

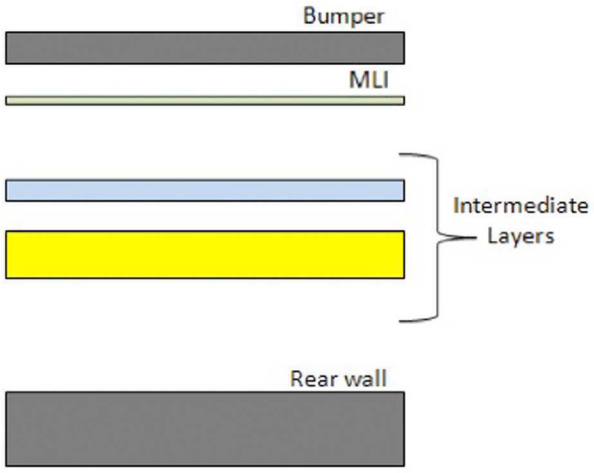
## APPLICATIONS

- Radiation shielding
- Fuel tank liners
- Healing layers in ballistic protection for armor, helmets and other personal protective equipment
- Packaging material
- Human prosthetics
- Wire insulation material
- Space habitats and structures
- Micrometeoroid and orbital debris protective liners

technology solution

## THE TECHNOLOGY

Puncture healing melt blends were developed by melt blending self-healing polymers with non self-healing polymeric materials. The self-healing polymeric materials consisted of Surlyn® 8940, Affinity™ EG 8200 G, and poly(butadiene)-graft-poly(methyl acrylate-co-acrylonitrile) or Barex® 210 IN. The non-self-healing polymeric materials consisted of poly(ether ether ketone) (PEEK), LaRC phenyl ethynyl terminated imide 330 (LaRC PETI 330), and Raptor Resins Bismaleimide-1 (BMI-1). Puncture healing blends were also prepared with chopped glass and chopped carbon fibers. The overall goal was to develop a product with superior properties relative to either of the starting materials. The melt blends were prepared in varying compositions to optimize desired properties of the resulting matrix. Ballistic testing was conducted to determine the self-healing characteristics of several developmental polymers subjected to micrometeoroid type damage.




Stuffed Whipple Shield Configuration. Image credit: NASA/Keith Gordon

## PUBLICATIONS

Patent No: 9,156,957

Patent Pending

More Information

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