

Materials and Coatings

Shape Memory Polymer Bonding Method

Adhesive strength enhancement of shape memory
polymer composite and metal joint

NASA Langley Research Center has developed technology to increase the adhesive strength between shape memory polymer composites (SMPs) and metal alloys. Shape memory materials, including SMPs, have been explored for numerous applications because of their unique shape memory capabilities. These materials can change shape and/or other properties in response to changes in an external stimulus such as stress, temperature or an electric field. Applications include use as an adaptive wing structure, smart armors, and intelligent medical devices.

BENEFITS

- ➔ Increased adhesive strength between an SMP and a metal alloy
- ➔ Allows SMPs to be bonded to metal alloys including but not limited to titanium alloys

APPLICATIONS

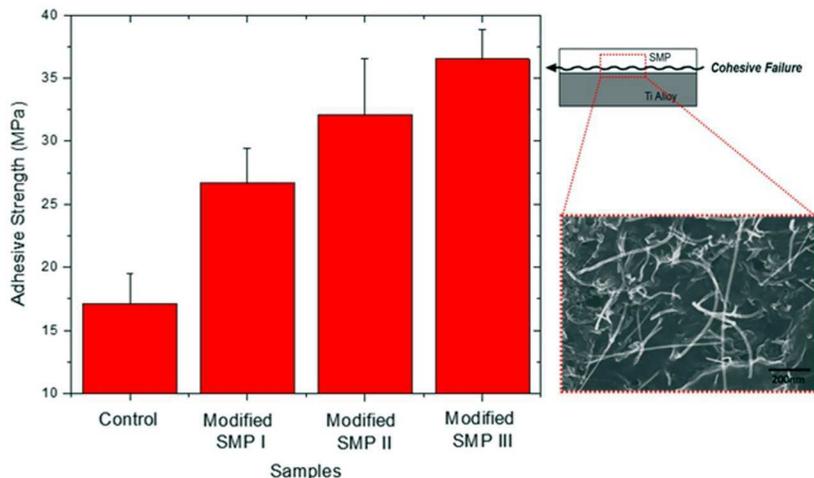
- ➔ Adaptive aircraft structures
- ➔ Adaptive space structures
- ➔ Smart fabrics
- ➔ Intelligent medical devices
- ➔ Morphing structures
- ➔ Packaging
- ➔ Strong adhesion interfaces between polymer and metal for airframes and engines
- ➔ Durable interface for infrastructure (building, bridge, etc)

technology solution



THE TECHNOLOGY

Initially developed for use in an adaptive wing structure, this NASA technology is a method to enhance the bond strength of SMPs that are joined to structural metal alloys. The method utilizes toughening and coupling agents to create better cohesion within the SMP and better adhesion between the SMP and metal alloy at the material interface, thus reducing the possibility of fracture leading to catastrophic failure. Tests have shown this innovation to more than double the adhesive strength between an SMP and a metal alloy when compared to a non-modified system.



Graph showing adhesive strength and image of toughened SMP

PUBLICATIONS

Patent Pending



National Aeronautics and Space Administration

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