



TECHNOLOGY SOLUTION

Materials and Coatings

AERoBOND+ for Manufacturing Composite Structures

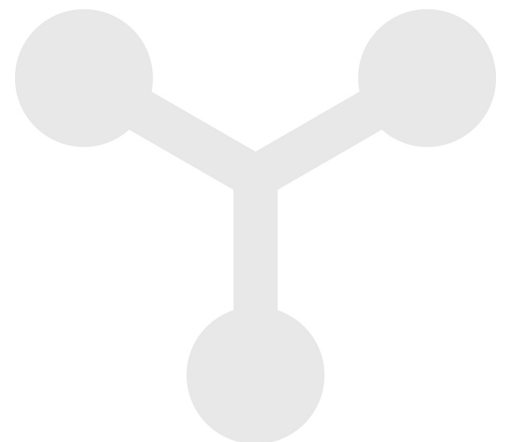
[Prepreg/adhesive layer design improves ability to join mating surfaces](#)

The original AERoBOND technology was developed to enable co-cure joining and manufacturing of large composite structures without the use of fasteners. The AERoBOND technology provides novel prepreg and resin formulation designs to improve the joining and manufacturing of high-performance, large composite structures such as those used in aviation and aerospace applications. AERoBOND can also be used for many other prepreg-based composite structures, small and large, in many industrial applications. The joint quality can be exceptional, and the cost and efficiency of manufacturing is improved.

The new AERoBOND+ innovation is a next-generation innovation that widens the scope of potential applications of AERoBOND to include those where the mating surfaces are less than ideally matched. This new innovation is accomplished with critically designed resin/adhesive/prepreg formulations and layer designs across the joint between each of the faying surfaces.

BENEFITS

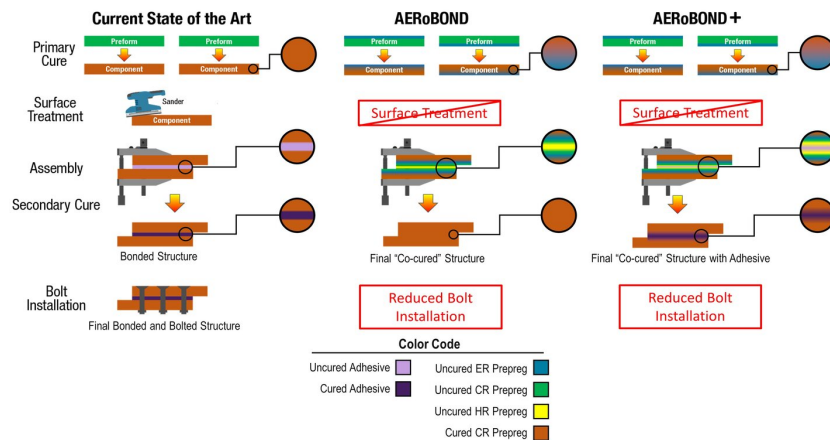
- High mechanical integrity of composite joints, even for those with low tolerance for matching of faying surfaces
- Cheaper, faster composites joining and fabrication using low-precision tooling
- Resistance to surface contamination of the bonding surfaces
- A drop-in solution for composites joining



THE TECHNOLOGY

The AERoBOND and AERoBOND+ technologies are composite resin materials design innovations that enable new methods for composites joining and manufacturing. The resins are formulated with carefully selected off-set stoichiometries to delay/control the cure such that initial curing of individual components can be followed separately by joining/curing of components together. The ability to delay and control the co-cure joining step provides ease of manufacturing of multi-part composite structures, without compromising joint integrity. There are significant cost savings associated with eliminating fasteners and joint surface preparation steps. To date, the focus of the NASA development effort has been on novel epoxy-based prepreg formulations though other types of thermosets could be considered as well.

The AERoBOND+ innovation provides an added adhesive layer to the AERoBOND joint design to improve the ability to join composite surfaces when these surfaces are less tightly matched. Conventional adhesives, e.g., film, paste, etc., are employed. By including an adhesive between the offset stoichiometric prepreg plies, the adhesive can fill the gaps between the bonding surfaces while maintaining reflowable AERoBOND layer interfaces. Since all interfaces are reflowable, they are much more tolerant of surface contamination, thereby mitigating a primary challenge for conventional adhesive bonding.



During secondary cure, the adhesive used in AERoBOND+ squeezes into the gaps between the bonding surfaces and fills them. Also, during secondary cure, the epoxy rich material reflows and mixes with the hardener rich resin and fully cures, while mitigation challenges in surface contamination of conventional adhesive joining.

APPLICATIONS

The technology has several potential applications:

- AERoBOND+ has broad potential application for the manufacturing of composites used in all industries, including:
- Aerospace, including large assembled composite structures for airframes
- Marine, recreational and commercial construction
- Automotive
- Building and Construction

PUBLICATIONS

Patent No: 10,369,767; 10,549,516

Patent Pending

technology.nasa.gov

More Information

National Aeronautics and Space Administration

Agency Licensing Concierge

Langley Research Center

Mail Stop 020
Hampton, VA 23681
202-358-7432
Agency-Patent-Licensing@mail.nasa.gov

www.nasa.gov

NP-2023-11-3197-HQ

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

LAR-20315-1, LAR-19860-1, LAR-18677-1, LAR-18677-1-CON, LAR-TOPS-380