

Huntsman Advanced Materials focuses on new generation composite and adhesive materials for aerospace interiors

The use of composite materials on aircraft interiors in pursuit of the same performance demands that motivate the OEMs of primary structures continues to emerge from the shadow of composite airframe applications.

With fuel prices currently accounting for over a third of operating costs, it is now widely recognised that interior composites can deliver significant cost savings in this area.

Given the valued combination of low weight, high strength, and processing efficiencies they deliver to the aircraft manufacturing environment, it's clear to see why composite materials have a promising future in passenger aircraft interiors, especially now that Huntsman's structural application chemistries offer low flammability.

A change in direction for aircraft interiors

Demand for the provision of materials that ensure OEMs meet the very stringent fire, smoke and toxicity (FST) mandates set by the Federal Aviation Regulations (FAR) Part 25, remains as crucial as ever.

To date, this has very often been the stumbling block for structural solutions, or chemistries such as epoxies, but remains a key focus for Huntsman in product development.

Fast curing FST solution

Araldite® FST 40002 / 40003, a high-performance processing solution for aerospace composites interiors, is recognised as an entirely new and significantly advanced development in material science. In uniquely combining inherent FST properties with high quality, user-friendly processing methods, Araldite® FST 40002 / 40003 enables efficiently produced interior structural glass and carbon composites, with maximised weight savings.

By comparison with other composites solutions such as epoxy prepregs or thermoplastic organosheets, Araldite® FST 40002 / 40003's RTM and infusion processing capabilities enable - for the first time ever - the production of structural FST parts that are unrestricted by the degree of part complexity and function integration.

This non-halogenated, inherently flame retardant system meets the FAR 25.853 vertical burn, smoke and toxicity requirements for CFRP and GFRP in all thickness configurations without the use of any fillers.

The mixed two-component system exhibits a low viscosity at low working temperatures, c.a. 50°C. Its latency characteristics, between 50°C to 150°C, provide high flexibility in manufacturing. It allows the production of large parts with low-cost mold solutions, through the infusion process, as well as high productivity for small and medium parts, with an in-mold cure capability of 5 minutes at just 150°C, using the RTM process.

Araldite® FST 40002 / 40003 also has a low reaction energy of approximately 220 J/g, which eliminates bulk exothermic safety issues and enables high thickness composite parts production.

Challenging phenolic resins

As research into benzoxazine resins continues, these systems are showing their value as a cost-effective replacement for low-cost phenolic resins in aerospace interiors.

In curing without gas release, benzoxazine resins provide excellent surface finish and laminate quality and are also compliant with health and safety regulations.

Meeting the same FST and heat release requirements as phenolics, the new benzoxazine, Araldite® XU 35710 FST, offers superior properties and provides a cost-effective alternative aimed at a wider range of applications including semi-structural parts.

Compared to traditional benzoxazine resins, the new Araldite® XU 35710 FST offers low viscosity which makes it suitable for the formulation of solvent and hot-melt preregs, as well as for systems designed for direct processes, such as RTM.

Improving epoxy systems

As part of its ongoing drive to enable market differentiation for formulators, Huntsman continues to add new and innovative high-performance materials to its range of qualified building blocks. This approach is very much informed by the need to deliver mechanical and thermal performance improvements for aircraft components.

One of the latest additions to the company's building blocks range is Araldite® MT 40050 FST, a non-formulated but structurally fire resistant thermosetting epoxy resin that can replace or be combined with standard epoxies in prepreg formulations.

It can also be used in formulations for direct processes such as RTM, infusion and filament winding, to provide fire resistance, very low smoke density and toxicity as well as very good heat release behaviour.

With its inherent FST performance, Araldite® MT 40050 FST meets the FAR 25.853 / ABD 0031 FST and heat release standard when tested with a traditional high Tg liquid hardener in 1-ply GFRP configuration.

Performance and processing at a premium

As fire resistance regulations become more stringent, Huntsman is constantly developing its Epocast®, Epibond® and Araldite® epoxy adhesives and syntactics ranges to meet the requirements of fast assembly, weight reduction and REACH compliance and safety.

Epocast® epoxy syntactics are produced in a range of densities to meet specified handling and performance requirements. Many of these materials are self-extinguishing and feature easy-to-apply viscosities, sag-resistance and high strength.

For example, Epocast® 1645 FR, a new ultra-low density syntactic complies with FAR 25.853 FST requirements for honeycomb void and edge filling. Similarly, the new low

density syntactic Epocast® 1622 FAT A/B helps to optimise weight on a variety of applications, including honeycomb reinforcement and potting of fasteners.

Compliant with FAR 25.853 regulations and available in cartridges for easy application, Huntsman's latest epoxy adhesive, Epibond® 8000 FR is suitable for metal and composite bonding and honeycomb or insert potting applications requiring fire and high mechanical performance.

To summarise, composites currently account for just 20 to 25% of the total interior weight of an aircraft and there is huge potential for this to increase to as much as 30-40% within the next ten years.

In this context, the new generation of composite materials has an important part to play in answering industry demand for 'alternative' offerings that meet all performance criteria now seen as standard, whilst delivering new advantages in the form of better processing efficiencies that can ultimately help the airlines to retain a competitive edge in the face of rising operating costs.