BALLISTIC & DEFENCE

Composites are very versatile materials and offer advantages in many different ways, particularly if the application requires strength and stiffness, with low weight. For the Ballistic and Defence market, laminates provide effective ballistic protection at a much lower weight than metallic armour materials.

Gurit has a track record of innovation in the composites industry spanning 30 years and has recently developed and qualified a ballistic phenolic prepreg, which is now being introduced to the market. Composite armour works by absorbing the kinetic energy of the projectile as it passes through the laminate. There are three distinct stages involved in the stopping of a projectile: firstly, the blunting or deformation of the projectile, secondly, the slowing phase and, thirdly, the catching of the projectile. A composite laminate is made up of multiple layers of reinforcement fibres and resin. These layers are engineered to de-laminate at the impact of a projectile. This effect greatly enhances the slowing and stopping of the projectile over other materials. The biggest advantage of composite armour over steel is the significantly lower weight. It can be up to 50% lighter, while providing equivalent protection against projectiles. Projectiles do not need to be bullets. In fact, artillery or mortar shells, aerial bombs, grenades and antipersonnel mines are all fragmentation devices whose steel casings burst into small fragments when their explosive cores go off.

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The most common form of anti-ballistic composites is made from a combination of glass reinforcement and phenolic resin. The ballistic protection properties can be enhanced by altering the fibre and resin type: Stronger fibres like S2 glass increase the ballistic protection of a laminate over E-Glass by 10–20%. Similarly, stronger epoxy resin can increase the anti-ballistic performance over phenolic resin. Yet, epoxy is less desirable due to its lower fire resistance.

As engineered materials, composites are designed to meet special requirements including threat levels, weight requirements and cost restrictions. Typically, solid composite armour is made from phenolic resin and reinforcement fibres showing a resin content in the region of 18–20%. Personal armour does not need to be structurally strong, so the composite plates used are made with even lower resin content laminates (<12% by weight). Ceramic composites offer a greater level of hardness, which can deflect or blunt the projectile before stopping it by underlining composite or steel, again this application uses a different form of composite material.

Composite armour is used in the production of military vehicles, land-based shelters, ships and aircraft. It can be used as a structural material or as secondary plate armour just for protection. The need to reduce the weight of armoured vehicles has led to a large volume of composites being used in this area. Gurit's new ballistic phenolic prepreg PF 700 has been developed with this in mind. It meets the FST requirements and conforms to the threat levels required for this market. It is also suitable for production of flat panels in a press moulding process or for moulding more complex parts by autoclaves.

Gurit's PF 700 resin has been developed internally with input from industry leaders specialising in defence applications.

- Up to 50% lighter panels when compared to steel
- Suitable for press moulding for production of flat panels
- Suitable for autoclave for complex shapes
- Successfully tested by Cranfield University, Impact and Armour Group
- Approved by AGY, meets HJ1 qualification
- Conforms to US Military specification MIL-DTL-64154B

Weight of Composite Panel stopping a 7.62mm (0.3 Calibre) Fragment Simulation Projectile (FSP) at 750 m/s