METPREG™

METALLIC PREPREGS FOR THE COMPOSITES INDUSTRY

TOUCHSTONE RESEARCH LABORATORY, LTD.

FILAMENT WINDING

Fiber reinforced aluminum is enabling for applications requiring stiffness and strength especially at high temperatures. Filament winding, a high speed form of additive manufacturing, has been around for decades and remains one of the most cost-effective methods for mass production of composites. The confluence of these two technologies, namely a low-cost filament winding process with high-performance metal matrix composite materials, can lead to great improvements in the ability to produce affordable MMC structures by driving down costs and improving manufacturing capabilities.

Touchstone Research Laboratory has developed a process to filament wind its MetPreg metallic prepregs. This breakthrough process can be used for manufacturing cylinders, spheres, or other shapes.
Hydrostatic burst testing on finished cylinders has demonstrated translation efficiencies of more than 85%.

This technology is ideal for:

·Rocket motor cases
·Pressure vessels
·Aerospace storage tanks
·Ordnance items
·Hydrogen fuel tanks
·Tubular structures

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A Breakthrough Technology

MetPreg filament wound vessels have excellent burst pressure, longitudinal and torsional stiffness, and compressive strength. The compression strength for these materials can be as high as 4.0 GPa (580 ksi), which makes them ideal for gun-launched ordinance applications where high compressive loads are experienced. These properties are maintained at high temperatures. They provide weight reduction opportunities for structural engineers and designers.

Typical Properties of MetPreg Cylinders

(50% Fiber Volume Fraction, 4060 psi Burst)

Density	3.30 g/cm^3
Wall Thickness	0.095 in
Weight per Linear Inch	0.24 lb/in
Internal Volume per Linear Inch	36.4 in^3/in

Features

- Highly repetitive part-to-part fiber placement
- Large structures can be built without costly casting mold investments
- Low-cost manufacturing process
- High fiber volume attainable
- Continuous fiber used over entire component area
- Maintains 80% of its room temperature longitudinal tensile strength to greater than 1000°F
- Field repairs are possible with soldering and brazing equipment
- Permeability of H2 through the aluminum matrix is negligible
- Compatible with liquid O2 and many propellant chemistries
- Does not microcrack at cryogenic temperatures
- Does not outgas under vacuum
- Properties are unaffected by high humidity
- UV exposure causes no degradation of properties
- Electrically conductive - no static charging
- Coefficient of thermal expansion is approximately half that of aluminum
- Integral flanges and end closures for pressure vessels can be wound-in
- Remains impermeable to He after 100 cycles between -450°F and 250°F