OS-6 and NCF-6 Series Product Overview

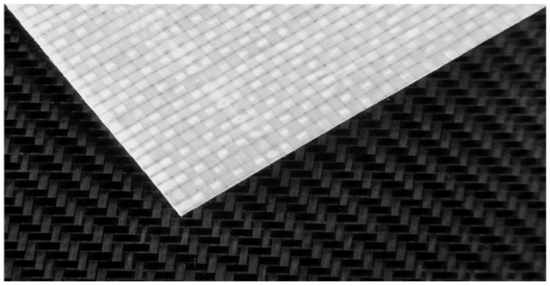
Nylon 6 Composite Sheets

Nylon 6 Organosheets and Non-crimp Fabric Composites

Products in the OS-6 and NCF-6 series are nylon 6 thermoplastic composite sheets in which fabrics are fully impregnated with nylon 6 resin. OS-6 series products are organosheets containing woven fabrics, while in the NCF-6 series the fabrics are non-crimp.

Key Benefits

The nylon 6 composite sheets are produced using a Johns Manville (JM) proprietary technology, which enables the control of fiber content in composites and offers design flexibility for specific applications by incorporating the desired fiber orientations into fabrics with various weaving architecture.
Woven fabrics and non-crimp fabrics as heavy as 2,500 g/m^2 are fully impregnated in one step, thus eliminating the need for lamination/consolidation steps to build up thickness.



Glass fiber and carbon fiber OS-6 series nylon 6 organosheets

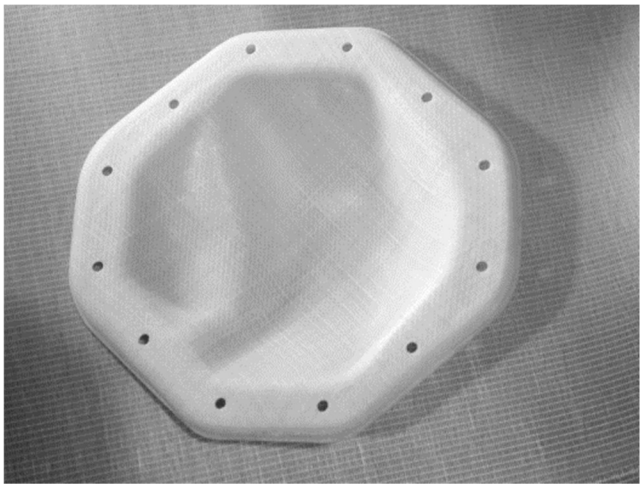
JM Proprietary Technology

JM's expertise in glass fiber manufacturing, an in-depth understanding of fiber-polymer interfaces and constant monitoring of the trends in the composites market led to the development of a pioneering manufacturing technology to produce fully impregnated nylon 6 organosheets.
The proprietary technology, covered by multiple U.S. and foreign patents, is versatile in terms of reinforcing materials and can be used to impregnate glass, carbon, aramid and hybrid reinforcements.
Nylon 6 organosheets are produced in a continuous process through the impregnation of fabrics with low viscosity caprolactam monomer, followed by the *in situ* anionic polymerization of caprolactam to form the thermoplastic polyamide matrix.

Applications and Processing

Organosheets in OS-6 and NCF-6 series are ideal structural reinforcement solutions for lightweight parts. They are suitable for high throughput manufacturing processes, such as injection overmolding and compression overmolding, and enable the incorporation of complex features into structural thermoplastic composites while meeting short cycle time requirements.

Example of overmolded features for lightweight automotive parts containing OS-6 series nylon 6 organosheets. Courtesy of ARBURG *GmbH + Co KG and GKTool*

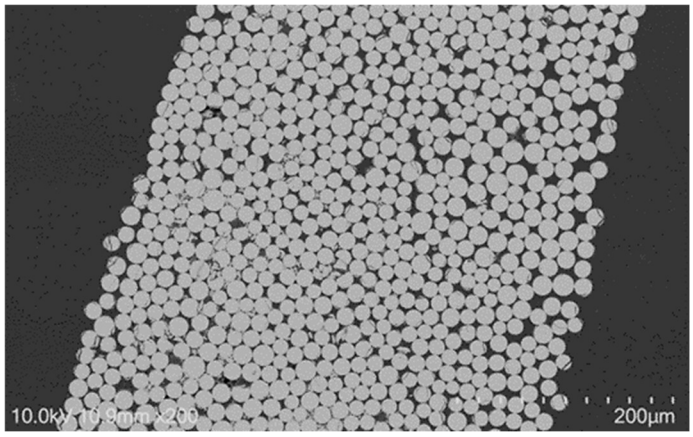


Prototype rear differential cover thermoformed from NCF-6 series organosheet. Courtesy of University of Maine

Advantages of OS-6 and NCF-6 Series over Conventional Organosheet Products

Conventional organosheets are produced by impregnating fabrics with molten thermoplastic polymers. The viscosity of the polymer melt limits the extent and speed of resin impregnation, as well as the choice of fabrics that can be impregnated.
OS-6 and NCF-6 series organosheets are produced through impregnation and *in situ* polymerization of caprolactam, a very low viscosity monomer. This leads to:

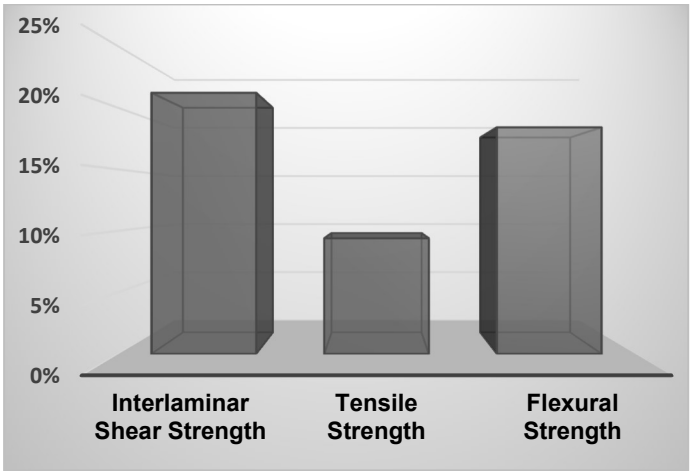
- complete impregnation of complex fabrics;
- void-free composites;
- high molecular weight nylon 6 resulting from anionic polymerization of caprolactam.



Fully impregnated nylon 6 organosheet

Additional Advantages for Glass Fiber Composites

JM's reactive glass product, StarRov® 886 roving, has the sizing chemistry tailored for promoting the polymerization of caprolactam. The reactive sites on glass fiber surfaces provide strong fiber-resin bonding, resulting in improved properties of the glass fiber nylon 6 composites.



Improvement in composite properties achieved with JM reactive glass products

Samples

Johns Manville Composites in the OS-6 and NCF-6 series are semi-finished sheets. Samples, including cut-to-shape sheets, are available upon request. Wider sheets (1.5 meter) will be available for evaluation in early 2020.

About JM

Johns Manville, a Berkshire Hathaway company (NYSE: BRK.A, BRK.B), is a leading manufacturer and marketer of premium-quality building and specialty products. In business since 1858, the Denver-based company has annual sales of $3 billion and holds leadership positions in all the key markets that it serves. Johns Manville employs 7,500 people and operates 43 manufacturing facilities in North America, Europe and China.

Additional information can be found at www.jm.com.

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