

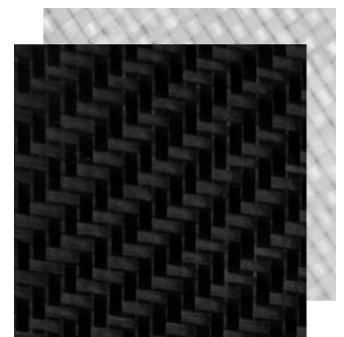
Advanced Composites Portfolio Overview

Neomera™ PA-6 Composite Sheets

Johns Manville, a leading provider of glass fiber reinforcements, has developed an innovative process for producing polyamide-6 (PA-6) composite sheets. The new proprietary technology is based on anionically polymerized PA-6 (AP nylon) and fiber reinforcements (glass fiber, carbon fiber or hybrids). The new composites are marketed by Johns Manville Advanced Composites under the brand Neomera™.

Technology Platform

JM's expertise in glass fiber manufacturing and in-depth understanding of fiber-polymer interfaces in composites led to the development of a pioneering manufacturing technology to produce fully impregnated PA-6 composite sheets. 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. Neomera™ PA-6 composite sheets are produced in a continuous process through the impregnation of fiber reinforcements with low viscosity caprolactam monomer, followed by the *in situ* anionic polymerization of caprolactam to form the thermoplastic polyamide matrix.



Neomera™ PA-6 Composites Portfolio and Key Attributes

JM has created a portfolio of PA-6 thermoplastic composite sheets that offer a wide range of material solutions. The product portfolio includes:

- **OS-6 and IG-6 Series** – PA-6 organosheets based on woven fabrics
- **CR-6 Series** – PA-6 composite sheets based on chopped fiber reinforcement
- **NCF-6 Series** – PA-6 composite sheets based on non-crimp fabrics.

NEOMERA™	OS- 6 & IG-6 SERIES	CR- 6 SERIES	NCF- 6 SERIES
Resin	PA-6	PA-6	PA-6
Fibers*	continuous, woven	chopped roving	continuous, non-crimp
Strength	•••	••	••••
Stiffness	••••	•••	••••
Impact Resistance	••••	•••	••••
Formability	••	••••	•••

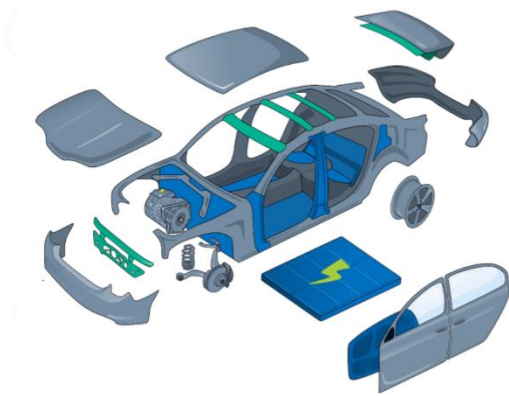
*glass/carbon/aramid/hybrid

Advantages over Other Thermoplastic Composite Sheets

JM Neomera™ PA-6 composite sheets are manufactured through impregnation and *in situ* polymerization of caprolactam, a very low viscosity monomer. This leads to:

- lower cost
- complete impregnation of reinforcing fibers
- void-free composites
- high molecular weight PA-6 resulting from anionic polymerization of caprolactam.

Applications and Processing



The Neomera™ PA-6 composite sheets are ideal for applications requiring:

- light weighting
- part integration
- design flexibility
- high volume composite manufacturing
- short cycle time
- recyclability.

OS-6, IG-6 and NCF-6 Series products are ideal for hybrid molding processes such as injection and compression overmolding. CR-6 Series products are excellent for thermoforming, stamping and other compression processes.

Brake pedal

Applications: automotive
Material: OS-6 Series
Process: injection overmolding



Courtesy of ARBURG GmbH + Co KG and GKTool

Seat pan

Applications: automotive
Material: CR-6 Series
Process: compression molding



Courtesy of Fraunhofer Project Center for Composites Research (London, Ontario, Canada)

Rear differential cover

Applications: automotive
Material: NCF-6 Series
Process: press forming



Courtesy of University of Maine (Orono, Maine)

Samples

Johns Manville Composites in the OS-6, IG-6, CR-6, and NCF-6 Series are semi-finished sheets. Samples, including cut-to-shape sheets, are available upon request. Depending on fabric configuration, wider sheets (up to 1.5 meter) are available for evaluation.

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 over \$3 billion and holds leadership positions in all the key markets that it serves. Johns Manville employs 8,000 people and operates 46 manufacturing facilities in North America, Europe, and China.

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