Composite Materials For Demanding Bearing And Wear Applications

NORPLEX MICARTA






Global Thermoset Composite Solutions

norplex-micarta.com

Composite Materials For Demanding Bearing And Wear Applications

Unparalleled functionality
Norplex-Micarta produces a full line of high-performance composites for heavy equipment and agriculture, hydro electric and power generation, ship building and marine, and other energy and processing industries, including materials specifically designed for bearing and wear applications.

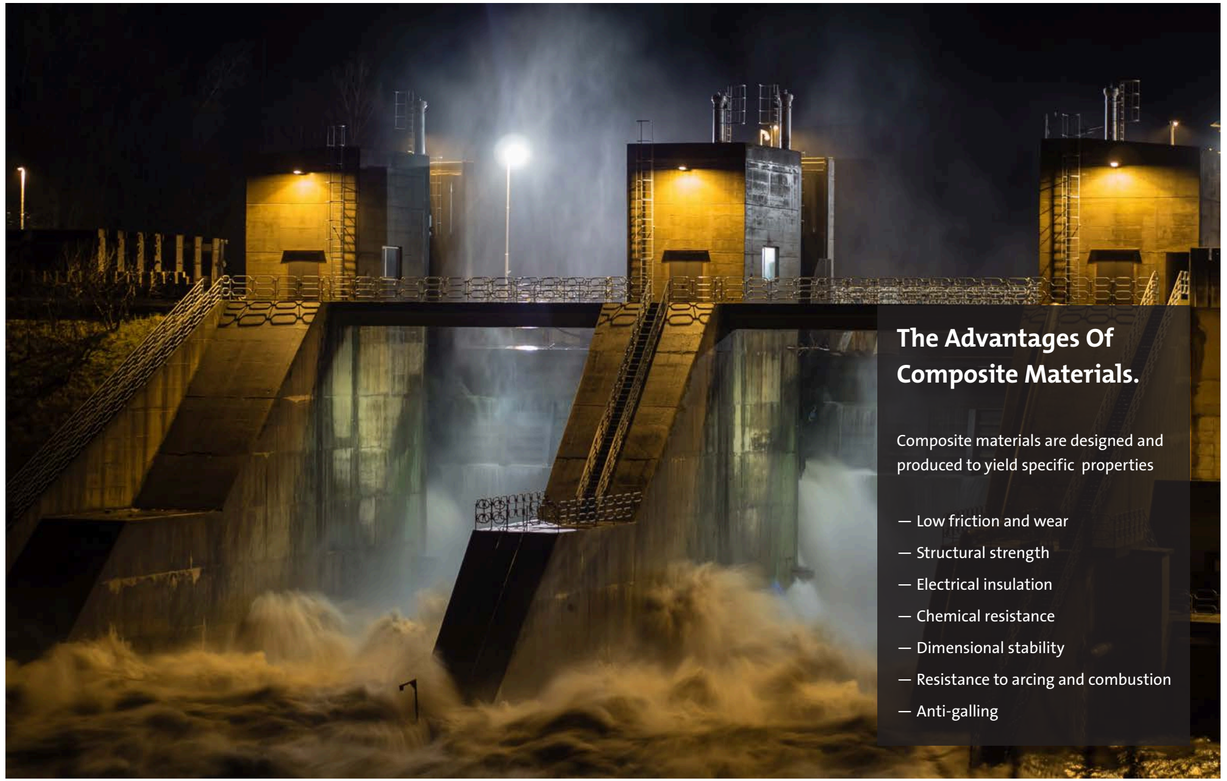
Engineering materials for demanding environments
Starting with tough, chemically resistant, and proven resin systems, Norplex-Micarta's materials are specifically engineered to the requirements of a particular application. The ability to combine multiple materials allows for a wide range of performance demands to be met economically. Heat can be removed by adding metal wire, PTFE surface layers can promote improved break-in, aramid fibers can provide both excellent strength and low wear, and reinforcements can be chosen to minimize moisture absorption.

New to the Norplex-Micarta portfolio of bearing and wear materials are hybrid fabrics. These materials allow for optimized performance and value in the individual layers of the composite. Produced in sheets or tubes, these materials can be combined with traditional composite materials to further expand design and performance options.

Self-lubricated, fully bearing, shock resistant, electrically insulating, and easily fabricated
Norplex-Micarta's composite bearing and wear materials have many benefits:

- The materials are inherently strong and do not require a metal backer
- Lubricants can be added to the resin system to allow for even dispersion and dry running.
- The materials have the ability to withstand shock and side loads and tolerate misalignment.
- Grades without graphite lubrication are electrically insulating which helps to minimize galvanic corrosion.

All of these benefits in the application come from a material that is easily fabricated with standard machine tools, often at speeds faster than metal alternatives.



The Advantages Of Composite Materials.

Composite materials are designed and produced to yield specific properties

— Low friction and wear
— Structural strength
— Electrical insulation
— Chemical resistance
— Dimensional stability
— Resistance to arcing and combustion
— Anti-galling

Designed For Performance In Specific Applications

Specialty composites are ready for the most challenging assignments
Each individual thermoset composite from Norplex-Micarta is designed to solve a specific set of challenges. Composites can be engineered to provide structural reliability under a wide variety of conditions. They protect product, facility and equipment by minimizing heat transfer, vibration, thermal expansion, abrasion and corrosion.

Norplex-Micarta thermoset composites are made by combining a resin matrix with a reinforcing substrate. Each combination is chosen for its ability to deliver controlled and repeatable performance to match the application's requirements. After the matrix and substrate are combined, a high-temperature curing operation creates a cross-linked molecular structure, which produces a material that does not melt. Pioneered by Norplex-Micarta, this process distinguishes our composites. Unique processing techniques can be used to combine any of several resins with a multitude of reinforcements to produce materials with innate properties that are superior to those of its individual components.

New solutions are always in development
Because industry demand for increasingly specialized materials continues to grow, significant development of new Norplex-Micarta composites is continually underway, providing custom solutions for customers with specific needs.

Customer driven solutions
We work directly with customers to solve complex problems. Our application engineers design unique materials and provide testing services to support the development of application-specific solutions.

The Preferred Source For Thermoset Composite Materials.

With generations of successful applications, Norplex-Micarta continues to support innovation and material development for demanding applications.

A History Of Leadership And Innovation Behind Today's Thermoset Composite Materials

Through each step in our evolution, we have led the development of new and advanced materials for industry and consumer goods. Norplex-Micarta consistently develops and supplies quality materials to OEMs and fabricators around the world for some of the most demanding applications.

1909: The thermoset composite industry is born when Leo Baekeland obtains a patent for the production of phenol.

MICARTA

Bakelite® is popular with consumers for radios, phones and more.

1945: The Northern Plastics Corp. that becomes Norplex is formed in Wisconsin USA.

NORPLEX

This era brings power generation, electronics, heavy industry manufacturing, automotive and aerospace innovation.

1965–75: Northern Plastics becomes Norplex and is acquired by Universal Oil Products Company, later called UOP.

NORPLEX MICARTA

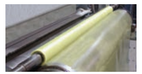
2013: Norplex-Micarta opens plant in China.

1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 | TODAY

1909: Using Leo Baekeland's phenolic resin, George Westinghouse invents Micarta for electrical insulation.

Westinghouse

1936: The largest generators at Hoover Dam produce 130 megawatts. Micarta provides electrical insulation and structural stability.

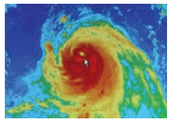


1955: The Micarta division of Westinghouse Electric is relocated to South Carolina USA to produce sheets, rolled tubes, molded shapes and other specialty materials.

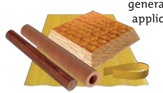
1965: Composite plastics are used to provide insulation and structural stability in electronic assemblies and small motors.

1990s: An era of medical breakthroughs: Non-conductive, light, non-magnetic, sterilization-ready components offer quiet operation and low attenuation.

2008: Delicate sensors released into the eyes of hurricanes are protected by a rugged Norplex-Micarta casing.



Norplex-Micarta continues to develop specialized thermoset materials for the next generation of applications.



Oil & Gas
Designed for extreme environments

Electrical Devices
Precise properties for advanced tech

Power Generation
Reliability and performance

Transportation
Durable solutions on the move

Medical Equipment
Supporting innovation

Aerospace
Proven in deep space

Military
Critical ballistic protection

Heavy Industrial
Tough, versatile, easy to machine

Analysis, Design, Engineering And Manufacturing

Standard products available
While composites offer an infinite array of possible material options, Norplex-Micarta has developed a suite of standard products specific for bearing and wear applications. These off the shelf materials, a few of which are highlighted on the next page, allow for rapid testing and analysis in new applications to inform a structured material design process.

Structured approach to design and engineering
Working with customers, Norplex-Micarta develops solutions to the unique challenges of specific applications. Applications engineers support customers to develop a set of design criteria for a new material. Utilizing test capabilities from internal and external laboratories, Norplex-Micarta product and process engineers then work to ensure that the customized material is stable, repeatable, and scalable from the raw materials through to delivery to the customer.

Manufacturing excellence
This work is primarily performed at the North American design and production facility in Postville, Iowa. This location is able to process a wide variety of resin and reinforcements into pre-preg, sheet, tube, and other shapes in an ISO 9001 certified facility. Customers in Asia can access these resources through our production facility and dedicated customer support teams in China.

Innovative Thinking Backed By Optimized Production

Our engineers design for nearly any condition, in, on, or above the earth.

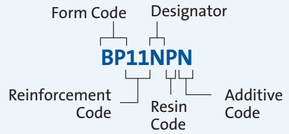
A structured design approach, backed by stringent testing and unique processing methods, allow for a predictable material that is also repeatable and economical at scale production.

All of this is built from decades of experience in product development and production of thermoset composites.

An Array Of Composite Material Options

Norplex-Micarta offers a wide range of material options for bearing and wear applications. To make selection and evaluation of these options easier to understand, we have developed a naming convention detailed below.

Grade Description Example



Forms:	Materials can be supplied as (BB) pre-preg, (BP) sheet, (BT) tube, and (BR) rod
Reinforcements:	10 – 19: Cotton 20 – 29: Linen 30 – 49: synthetic fibers such as polyester, PTFE, aramids and blends of synthetic fibers 60 – 69: paper reinforcements 80 – 99: combinations of reinforcements
Designator:	Digit reserved to differentiate constructions
Resin:	Most bearing and wear materials are made with (P) Phenolic resin. Other chemistries are available.
Additives:	Resin systems can be modified with additives to enhance performance. Additives include (A) Alumina, (G) Graphite, (M) Molly, and (P) PTFE.

Thus, BP11NPN is a sheet product produced from a medium weight canvas with no additives with a phenolic resin system.

Additionally, color options, surface modifications, and additional processing steps such as oil stabilization or sanding are possible. Norplex-Micarta's sales and applications engineering staff look forward to discussing your specific requirements. As a first step in the evaluation process, to the right are a few grades that are used in bearing and wear applications. These materials are available for baseline testing to inform a product analysis and design process for your specific application.

Featured Norplex-Micarta Composites For Bearing And Wear Applications

Grade BP11NPN:
A mid-weight canvas phenolic sheet material

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	3.50%
Flexural Strength	ASTM D790	18,000 / 17,000 psi
Flexural Modulus	ASTM D790	1,600 / 1,500 kpsi
Tensile Strength	ASTM D638	15,000 / 9,700 psi
Compressive Strength	ASTM D695	34,000 psi
Coefficient of Friction Dynamic	ASTM D4521	0.190

Grade BP18NPM:
A heavy weight canvas phenolic sheet material with molly

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	1.40%
Flexural Strength	ASTM D790	16,200 / 12,700 psi
Flexural Modulus	ASTM D790	937 / 818 kpsi
Tensile Strength	ASTM D638	10,200 / 6,300 psi
Compressive Strength	ASTM D695	34,000 psi
Coefficient of Friction Dynamic	ASTM D4521	0.20

Grade BP11NPG:
A mid-weight canvas phenolic sheet material with graphite

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	2.20%
Flexural Strength	ASTM D790	19,000 / 15,000 psi
Flexural Modulus	ASTM D790	1,200 / 1,000 kpsi
Tensile Strength	ASTM D638	10,000 / 7,000 psi
Compressive Strength	ASTM D695	38,000 psi
Coefficient of Friction Dynamic	ASTM D4521	0.092

Grade BP33NPN:
A polyester/PTFE hybrid fabric phenolic sheet material

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	2.0%
Flexural Strength	ASTM D790	21,000/6,700 psi
Flexural Modulus	ASTM D790	657/240 kpsi
Tensile Strength	ASTM D638	13,900/4,200 psi
Compressive Strength	ASTM D695	24,700 psi
Coefficient of Friction Dynamic	ASTM D4521	0.139

BT25NPN:
A bleached linen phenolic tube material

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	1.15%
Tensile Strength	ASTM D638	10,000 psi
Compressive Strength	ASTM D695	30,000 psi
Compressive Modulus	ASTM D695	380 kpsi

BT22ZPN:
A high density ultra-fine weave linen phenolic tube material

General Physical Properties	Test Method	Value
Moisture Absorption	ASTM D570	1.40%
Tensile Strength	ASTM D638	11,000 psi
Compressive Strength	ASTM D695	33,000 psi
Compressive Modulus	ASTM D695	400 kpsi

The grades presented above are not a complete product offering. Please contact Norplex-Micarta sales or applications engineering to discuss your specific requirements.

This data, while believed to be accurate and based on reliable analytical methods, is for informational purposes only. The terms and conditions of the agreement under which it is sold will govern any sales of this product. Data supplied above are "typical values," not to be considered "specification values."

To assure the material's performance is adequate for a specific application, customers should verify, independent of Norplex-Micarta, performance characteristics of interest.

It is the responsibility of the users of this information to make sure that they have the latest version of the Technical Data Bulletin, and are urged to check our website, www.norplex-micarta.com, to determine if information is most current.

Specification writers: Contact Norplex-Micarta for specification values before submission.

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