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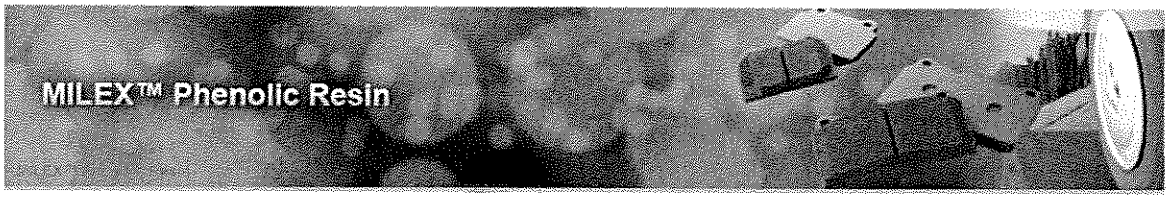
Home > MILEX™ Phenolic Resin



Introduction | Characteristics | Applications | Properties | Contact

MILEX™ Phenolic Resin

Over the last two decades MILEX™ Phenolic Resin has grown into a complete product line of this high performing, flexible technology. Currently Mitsui Chemicals offers three different formulations of Phenolic Resin, which are being supplied to the North and South American markets by Mitsui Chemicals America, Inc.

All formulations are developed in accordance with the company's unique product methodology that enables effective and efficient achievement of proper caliper and composite formulation. Each different phenolic resin system was developed and specified to achieve critical performance indices and is available at different viscosities.

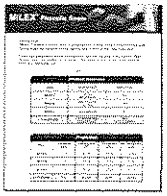
The following table illustrates the depth of the MILEX family of modified phenolics.

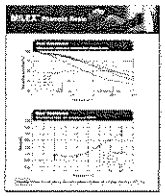
Series	Resin Type
RN RS	Acrylic Rubber Modified Resins Silicone Rubber Modified Resin
XL	Phenol Aralkyl Resins
RX	Less Silicone Rubber than that of RS

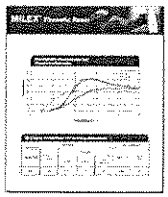
The key to the high value of Mitsui Chemicals' phenolic resin lies in the technical expertise of Mitsui Chemicals, which is evident in the resin's cure, the adhesive manufacture and composite cure bonding process employed by the company. The company's expertise comes from its established customer relationships and from years of experience with their respective applications and operating conditions.

New MILEX™ for the Premium After Market

Three new grades were recently developed to meet new demands of the Premium After Market. These new grades can contribute to the enhancement of brake performance in NVH, at a reasonable cost.


Product Overview & Properties


Heat & Wear Resistance

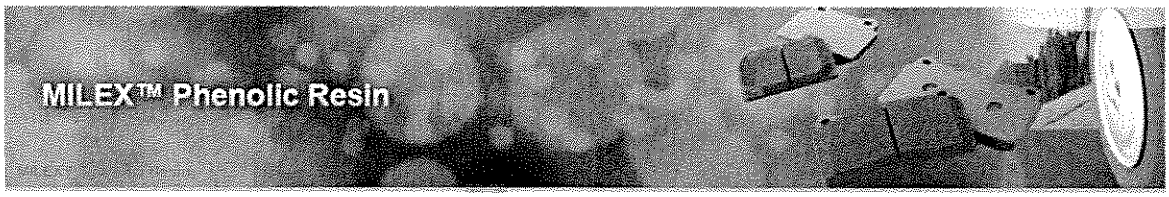

Moldability & Molding Condition

MILEX™ Phenolic Resin Automotive Applications

For the automotive industry, this has resulted in the development of phenolic resin that provides predictable, stable and durable performance over the lifespan of a brake pad or disc application.

MILEX™ Phenolic Resin Electronic Applications

For the electronics industry, MILEX phenolic resin is featured in some of the most demanding applications and is used to enhance the high heat resistance, moisture absorption and properly insulate electrical compounds in hostile environments.



MILEX™ Phenolic Resin Characteristics

There is an underlying set of unique characteristics that each formulation of MILEX™ Phenolic Resin possesses, which includes flexibility, strong heat resistance, low water absorption and good thermal shock resistance. All formulations of the resin work well under hostile environments and are uniquely suited to the requirements of the automotive and electronics industries.

RS/RN System Series

The RN series are novolak type phenolic resins modified by special elastomers. This series consists of a grouping of acrylic rubber modified resin in addition to the RS-2210MB grade, a silicon rubber modified resin.

This phenolic resin series is recognized worldwide by the automotive industry for its thermal shock and chemical resistant properties. In addition, this particular series possesses anti-brake noise and vibratory qualities in brake pad applications.

Some of the most demanding electrical applications choose phenolic resin due to the material's high dielectric strength, superior insulation resistance and high temperature resistance. Typical applications include use as an Epoxy Resin hardener for electronic materials such as encapsulation for I.C., an adhesive with elastomers and to improve the high heat resistance of thermoplastics.

XL System Series

The XL series is composed of phenol aralkyl resins, of which there are three different grade levels. The XL line is known for its stable friction and abrasion, excellent heat and chemical resistance and anti-noise and vibratory qualities.

In automotive applications, this type of phenolic resin is used in brake pads due to its stable friction and low abrasion. In electrical applications, the material is used as a molding compound that yields excellent heat and moisture resistant electrical insulation.

RX System Series

The RX series features one-grade level. The RX line is the company's most flexible friction technology developed to date. RX possesses the same characteristics and properties as XL, which are stable friction and abrasion, heat and chemical resistance and anti-noise and vibratory qualities.

Car manufacturers reap the benefits of all these characteristics, which result in a higher performing braking system. The material's flexibility reduces vibratory lurch during braking, while its strong heat resistance yields good friction and lower wear and tear. In addition, MILEX's thermal shock resistance facilitates the production of crackfree brake pads and discs and ensures that they remain crackfree for a longer period over the life of the brake pads and discs.

Electrical component manufacturers are able to develop high performing electronics that can withstand high heat and moisture with Mitsui Chemicals' phenolic resin.

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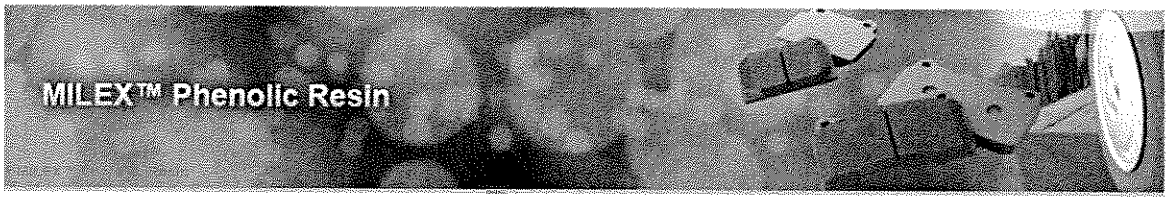

MILEX™ Phenolic Resin Applications

The MILEX™ Phenolic Resin Family of products is widely featured in brake systems of automobiles made by the top automakers through Mitsui Chemicals' affiliation with leading brake manufacturers.

Automotive Applications - Friction Materials for Brake Pad or Disc

The properties of MILEX resins yield superior brake pads that reduce noise, vibration and harshness (NVH). All phenolic resin formulations are developed in accordance with Mitsui Chemicals' unique product methodology that enables effective and efficient achievement of proper caliper and composite formulation. *The advantage of incorporating the MILEX material into a brake design is that the phenolic resin aids in the provision of a non-abrasive vibratory sensation free surface finish, which is very important in the performance of the brake system.* Additionally, its superior performance at elevated temperatures and excellent moldability:

- aids in brake noise reduction
- yields good friction
- significantly lowers vibratory lurch
- reduces system wear and tear

The benefits of this friction material to OEMs is shorter molding time and costs due to faster curing, significant NVH reduction and crack-free brake pads and discs. The phenolic resin is also compatible with all brake pads especially NAO.

Electronics, Adhesive and Additive for the Improvement of Thermoplastics

MILEX is used as an Epoxy Resin hardener for electronic materials such as encapsulation for I.C. due to its excellent properties, low water absorption and flexibility. The use of phenolic resin protects electronic devices from an adverse environment to increase and ensure device reliability to increase production yield.

In addition, the phenolic resin is used to improve heat resistance of thermoplastics and is used as an adhesive, especially with elastomers, to bond to metal.

View: Properties of MILEX XLC Series Chart

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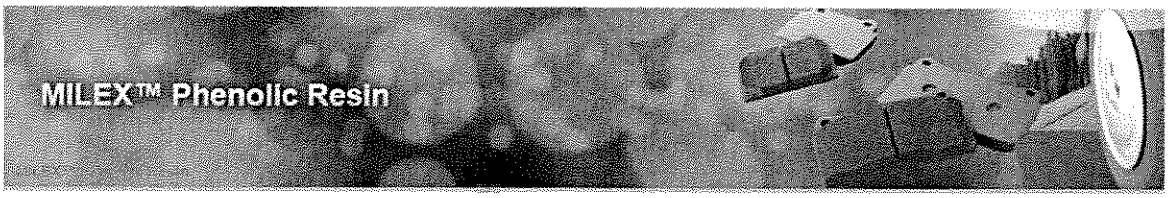

MILEX™ Phenolic Resin Properties

The following charts provide insight into the general, practical and molding properties of the MILEX™ Phenolic Resin family of modified phenolics.

General Properties

Tables of grade formulation of MILEX showing the general properties of the phenolic material.

Table 1: RS/RN Series
Table 2: XL Series
Table 3: RX Series

Practical Properties

A table presenting the practical properties for all MILEX Phenolic Resin grade formulations.

Table 4: Practical properties of MILEX

Heat Resistance

For a graphical depiction of the heat resistant properties of MILEX at 350°C in addition to information on the composition of the moldings, press condition and post curing condition.

Table 5: Ratio of Weight Decrease

For a graphical depiction of MILEX over 350°C in addition to the information on the curing and testing conditions.

Table 6: Resin

Phenolic Resin Molding Properties

For information on the molding frequency and amplitude angle of all formulations of MILEX resin.

Table 7: Curelastometer

Storage Modulus of Resin

For information on the storage molding and test conditions of phenolic resin, please view the chart below.

Table 8: Resins

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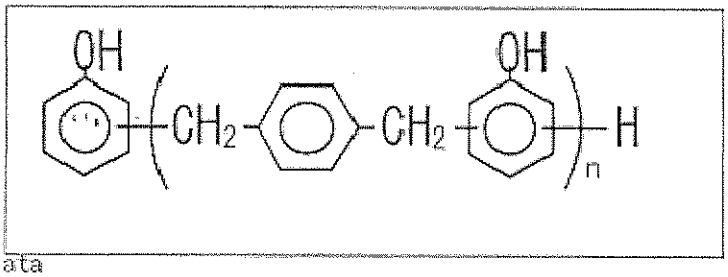
Properties of MILEX XLC Series



Technical Data

Properties of MILEX XLC (Typical Value)

Properties (resin)		unit	LL	3L	4L
Softening Point		℃	78.0	71.0	63.0
OH eq		g/eq	176	175	169
ICI Viscosity(150℃)		mPa・s	430	210	110
Free PhOH		wt%	0.06	0.08	0.04
Water Content		wt%	0.02	0.02	0.02
Hot Water Extraction					
	pH	—	5.3	5.4	5.1
	Na+	μg/ml	0.02	0.05	0.01
	Cl−	μg/ml	0.03	0.02	0.02
	SO4^2−	μg/ml	0.03	0.03	0.01
	Electric Conductivity	μS/cm	2.8	2.8	3.0

Statement Content

The statemant content is based materials, data and information currently available and no guarantee is made with regard to content, physical properties or harmful effects.

Furthermore, as handling precaution relate to normal handling, in case of special handling, safety measures appropriate to application and its method should be taken.

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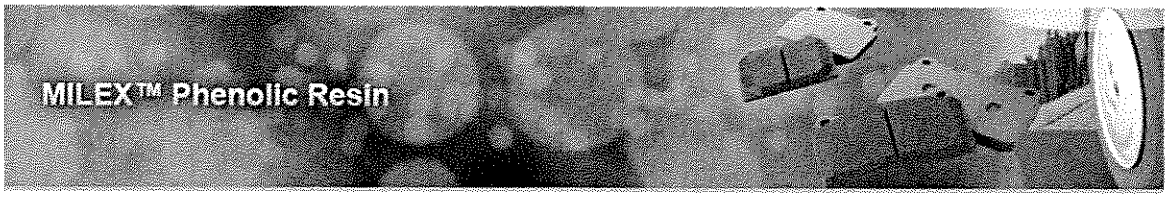

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MILEX™ Phenolic Resin

Company :*	
Street Address :*	
City, State & Postal Code :*	
Country :*	---Select Country---
Name :*	
Title or Position :*	
Phone Number :*	
Email Address :*	
Application:*	
How did you learn about this product?*	Please select : Search Engine Chemical Directory Tradeshow Magazine Ad Company Referral Existing Customer Please be specific:
Additional Comments:*	
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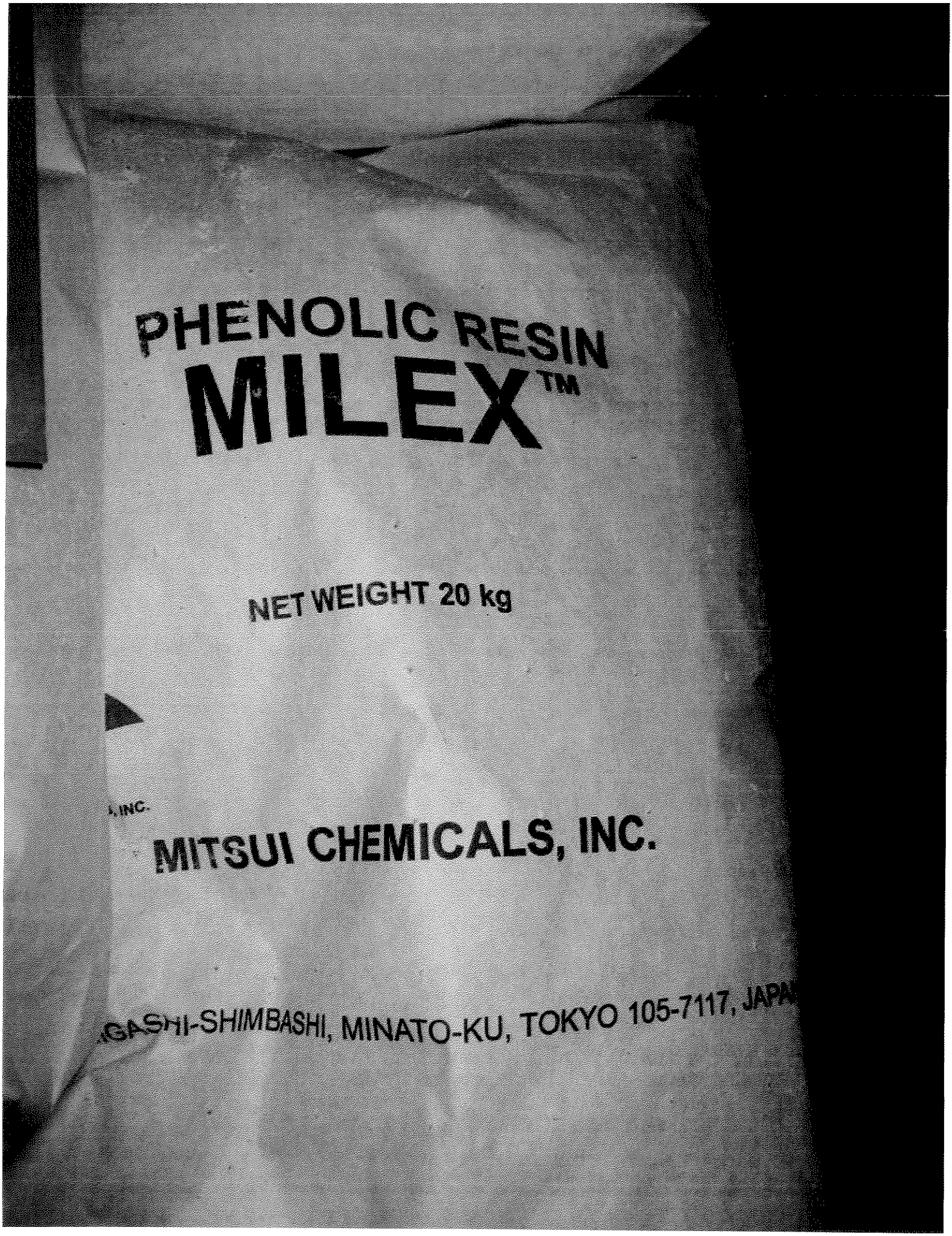
PHENOLIC RESIN
MILEX™
NET WEIGHT 20 kg
MITSUI CHEMICALS, INC.

三井化学名古屋工場　品質保証G　河合様

2012.06.06
新城工場
管理課

RN-2410MB　荷姿写真

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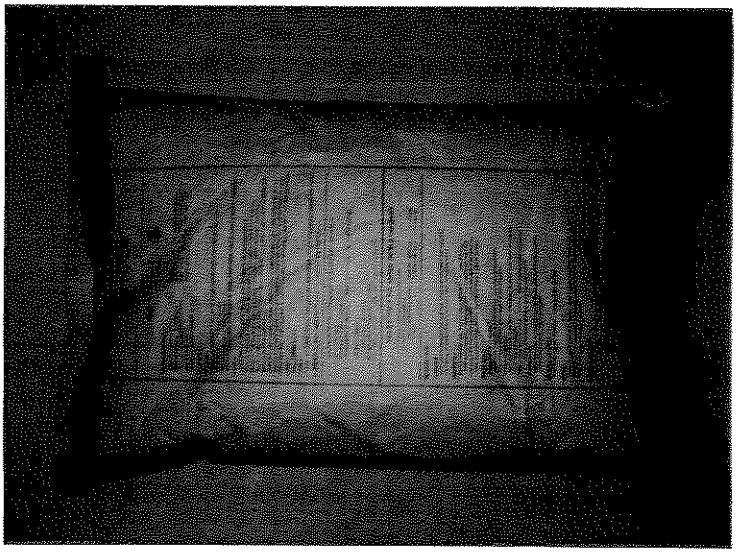

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MITSUI CHEMICALS, INC.

MITSUI CHEMICALS, INC.

Mitsui Chemicals, Inc.

2-5 Kasumigaseki 3-chome, Chiyoda-ku

Tokyo, Japan

Tel: 03-3592-4464

Fax: 03-3592-4253

MITSUI CHEMICALS AMERICA, INC.

2500 Westchester Avenue, Suite #110

Purchase, NY 10577

Tel: 914-253-0777

Fax: 914-253-0790

MITSUI CHEMICALS EUROPE GmbH

Ostrasse 10

40211 Düsseldorf, Germany

Tel: 211-173320

Fax: 211-323486

MILEX™

Handbook of Phenolic Resins for Brake Binders

Mitsui Chemicals America, Inc.

Pursuing chemistry's unlimited potential for precious earth and beautiful future...

The chemical industry has much to contribute to the future, as it continues adding to material wealth and human well being by providing technologies and materials to industries of every kind.

Mitsui Chemicals, Inc. aspires to become a diversified chemical company with a strong competitive position in the global market by applying its technical and chemical expertise. As it pursues chemistry's boundless potential, Mitsui Chemicals, Inc. is contributing broadly to society through innovations and creations of materials and products, while keeping in harmony with the global environment. One such example of the Company's pioneering spirit is its family of phenolic resins.

Phenol and Phenolic Resins

Mitsui Chemicals, Inc., one of the largest chemical companies in Japan, is also the third largest global producer of phenol, the raw material for producing phenolic resins. The Company began offering the first formulation of its high performing, flexible brake system technology, MILEX™* in 1980 and over the last two decades has built a complete phenolic resin line by leveraging its expertise and experience in the brake system marketplace. Mitsui Chemicals, Inc. is a top ranked producer in Japan and Asia.

The high value of the MILEX™ technology lies in the technical expertise of Mitsui Chemicals, which is evident in the resin's cure, adhesive manufacture and the composite cure bonding process employed by the Company. The Company's expertise comes from its established working relationships with its customers and from years of experience with their respective applications and operating conditions. This experience and expertise has resulted in the development of a material that provides predictable, stable and durable performance over the design life of a brake pad or disc application.

MILEX™ Sales in U.S.

Mitsui Chemicals makes three different grade formulations of MILEX™, which are being introduced to producers of original equipment manufacture brake pads and discs in the North and South American markets by Mitsui Chemicals America Inc., the US subsidiary of Mitsui Chemicals, Inc. The MILEX™ family of modified phenolics includes the XL system series, phenol aralkyl resins, RN system series, acrylic rubber modified resins, RS system series, silicon rubber modified resins, and RX series.

All formulations are developed in accordance with the Company's unique product methodology that enables effective and efficient achievement of proper caliper and composite formulation. The advantage of incorporating the MILEX™ material into a brake design is that the material aids in the provision of a non-abrasive vibratory sensation free surface finish, which is very important in the performance of the brake system. Additionally, its superior performance at elevated temperatures and excellent moldability aids in brake noise reduction, yields good friction, and significantly lowers vibratory lurch and system wear and tear.

This handbook is designed to function as a material selection tool by providing comprehensive product specifications on the MILEX™ phenolic resins grade formulations. Additional product information is available online at www.mitsuimilex.com or alternatively you can contact Mr. Hiroshi Tsukuemoto, the U.S. representative for the MILEX™ Family of resins directly (full contact information available at the end of this handbook). For information on Mitsui Chemicals America, Inc., please visit the Company's website at www.mitsuichemicals.com.

Mitsui Chemicals, Inc. adopted the MILEX™ trade name in 1979 specifically for the phenolic resin use in auto brake pads.

MILEX™ PHENOLICS

Hiroshi Tsukuemoto
Director
Performance Polymers Group

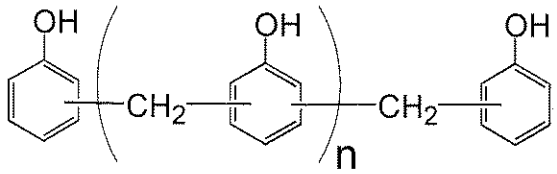
Tel: 914 251-4238 Fax: 914 253-0790
Email: h.tsukuemoto@mitsuichem.com

Mitsui Chemicals America, Inc.

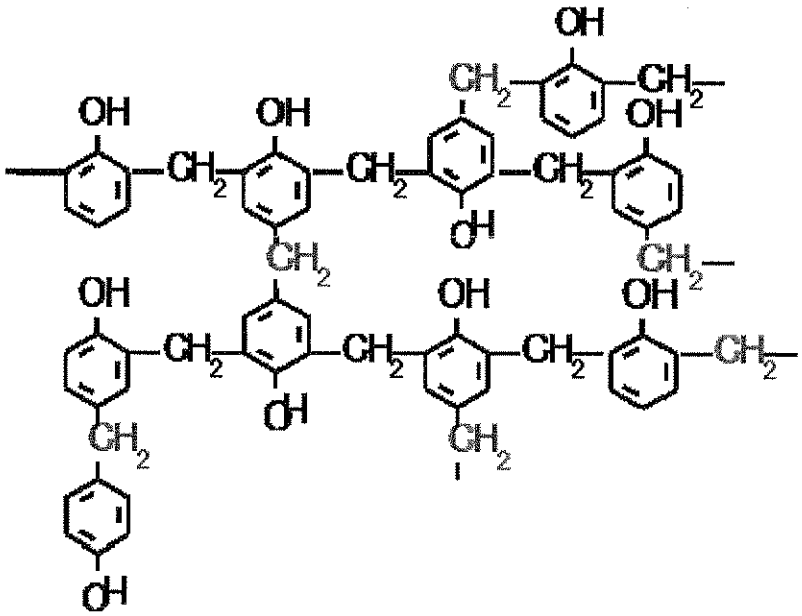
DIFFERENCE between MILEX and IMILEX

（1） MILEX™ (special phenolic polymer resin)

Base resins: novolac type phenolic resins or its modification



Then base resins are cross-linked by curing agents.



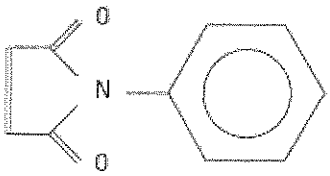
MILEX is used as binder resin for molding compound, including organic & inorganic fiber, filler and particle.

MILEX has higher heat-resistance, flexibility , moldability than straight novolac.

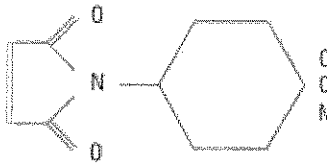
Usage of MILEX :
Automotive brake pad binder, epoxy hardner for IC encapsulation, molding compound binder, photo-resist binder

（2） IMILEX™ (representative derivatives of Maleic Anhydride)

IMILEX-P : Imidation with Aniline



IMILEX-C : Imidation with Cyclohexylamine



IMILEX is monomer , which readily undergoes homopolymerization and copolymerization with many kinds of vinyl monomers.

IMILEX is chemical agent , which has reactivity and unique properties such as radical polymerization, ion polymerization, photosensitivity and bacteriostasis.

Usage of IMILEX :
Modification co-monomer of various resins for high HDT
Intermediate for pharmaceuticals and agricultural chemicals
Bactericides, Fungicides
Additive agent in coating , adhesives , vulcanization of rubber , photosensitive resins and insulating varnishes