

**DENABOND** is agent to produce excellent adhesion between Polyester textiles and Rubber.

#### **DENABOND**

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Polyester reinforcing materials are increasingly being employed in the reinforcement of such rubber-based goods, and particularly as tire cord in the manufacture of rubber tires. These polyester reinforcing materials (e.g., polyethylene terephthalate filament or cord) possess physical characteristics such as high strength, flex resistance, high stretching modulus and low creep which make them outstanding materials for such reinforcement.

However, the use of polyester reinforcement materials in rubber reinforcement applications is subject to certain problems due to the poor adhesion properties associated with unmodified polyester materials.

The use of aqueous dispersions containing a combination of a resorcinol-formaldehyde condensation product and a vinyl pyridine latex (referred to as an RFL dip) is best known as an effective treating agent for improving the rubber adhesion of some synthetic polymer reinforcing materials, such as nylon and rayon. However, the RFL dips do not satisfactorily overcome the problems encountered with unmodified polyester reinforcing material adhesion.

We developed an aqueous ammonia solution of condensation product of chlorophenol, formaldehyde and resorcinol which produces an excellent adhesion between polyester textiles and rubber, and have been supplying this product under the trade name of **DENABOND** to many customers.

#### **DENABOND LA-S**

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Recently, the serious problem of high ammonium vapor content in the workplace has caused many customers to request a decrease in the ammonia content in our **DENABOND**.

To satisfy our customer's needs and to address this problem, we have developed new product containing modified chlorophenol formaldehyde resorcinol condensation: **DENABOND LA-S**.

The ammonia content of **DENABOND LA-S** is significantly lower than that of **DENABOND**.

The applications of **DENABOND LA-S** are the same as our conventional **DENABOND**.

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Standard recipe using **DENABOND LA-S** are shown at page 3 to 5.

And test results on adhesive strength using these products are shown at page 6.

## PHYSICAL PROPERTIES

UNIT	DENABOND	DENABOND LA-S
APPEARANCE	BROWNISH-BLACK LIQUID	BROWNISH-BLACK LIQUID
ODOR	AMMONIA ODOR	SLIGHTLY AMMONIA ODOR
AMMONIA CONTENT(%)	6.0	0.5
TOTAL SOLID CONTENT(%)	20	30
pH	10.8	8.3
VISCOSITY(mPa·s/ 25 )	30	110
STAGE	COMMERCIAL	COMMERCIAL

\* Each properties include of typical value.

\* DENABOND LA-S should be sealed with N2-gas.

## RECIPE for SINGLE DIPPING SYSTEM

### [ RECIPE 1 ]

#### RFL Solution

		dry	wet
NaOH	(10%)	0.5	5.0
Formalin	(37%)	4.5	12.2
Resorcinol		11.0	11.0
Water			291.8

Stir for 2 hours at 25C.

Nipol 2518FS	(40%)	96.0	240.0
Water			75.0
Total		112.0	635.0

Mature the solution for 20 hours at 25

#### Dipping solution

		dry	wet
DENABOND LA-S	(30%)	45.0	150.0
RFL Solution	(18%)	112.0	635.0
Total		157.0	785.0

dry        150    / 60sec

cure       240    / 60sec

Nipol 2518FS : Vinyl Pyridine Styrene Butadiene Copolymer Latex ( Nippon Zeon Co. Ltd. )

## RECIPE for DOUBLE DIPPING SYSTEM

### [ RECIPE 1 ]

#### 1st Dipping Solution

		dry	wet
DENABOND LA-S	(30%)	30.0	100.0
WATER			500.0
Total		30.0	600.0

#### 2nd Dipping Solution

		dry	wet
NaOH	(10%)	0.5	5.0
Formalin	(37%)	4.5	12.2
Resorcinol		11.0	11.0
Water			291.0
Stir for 2 hours at 25			
Nipol 2518FS	(40%)	96.0	240.0
Total		112.0	560.0

Mature the solution for 20 hours at 25

dry        150    / 60sec

cure       240    / 60sec

Nipol 2518FS : Vinyl Pyridine Styrene Butadiene Copolymer Latex ( Nippon Zeon Co. Ltd. )

[ RECIPE 2 ]

1st Dipping Solution

		dry	wet
NaOH	(10%)	0.5	5.0
Formalin	(37%)	4.5	12.2
Resorcinol		11.0	11.0
Water			291.8
Stir for 2 hours at 25			
Nipol 2518FS	(40%)	96.0	240.0
Water			293.3
Mature the solution for 20 hours at 25			
DENABOND LA-S	(30%)	32.0	106.7
Total		144.0	960.0

2nd Dipping Solution

		dry	wet
NaOH	(10%)	0.5	5.0
Formalin	(37%)	4.5	12.2
Resorcinol		11.0	11.0
Water			291.8
Stir for 2 hours at 25			
Nipol 2518FS	(40%)	57.6	144.0
Nipol LX-112	(40%)	38.4	96.0
Total		112.0	560.0

Mature the solution for 20 hours at 25

dry 150 / 60sec

cure 240 / 60sec

Nipol LX-112 : Styrene Butadiene Copolymer Latex ( Nippon Zeon Co. Ltd. )

## TEST RESULTS

**Polyester Cord**

1500D/2ply

**Dipping Conditions**

Double dipping system recipe 2 (shown in page 5)

**Test Results**

Product	T-Pull(Kg/cm)	
	150 /30min.	170 /70min
DENABOND	16.1	8.5
DENABOND LA-S	16.2	8.3
VULCABOND-E	15.8	8.3

➤ DENABOND LA-S can give almost same adhesive strength as DENABOND and VULCABOND-E.

**Rubber Compound**

Material	parts by weight
NR	72
SBR	48
Stearic acid	2
ZnO	3
HAF carbon black	70
Process oil	20
Anti-oxidant agent (phenol type)	1
Accelerator (Sulfenamide type)	1
Sulfur	2

## SAFETY IN USE

### [Storage]

DENABOND/DENABOND LA-S should be kept in tightly closed containers to avoid leakage of ammonia fume to the atmosphere and prevent lowering of the ammonia level in the solution. When handling, the working area should be well ventilated to avoid accumulation of ammonia fumes.

DENABOND/DENABOND LA-S should be stored in a cool place, preferably below 25 . Once the container has been opened, it is advisable to use the product as quickly as possible.

### [Health]

DENABOND/DENABOND LA-S is an aqueous ammonia solution of the active ingredients. It should be treated as if it were an aqueous ammonia solution. The product is alkaline and contact with the skin is to be avoided. Inhalation of the fumes should be avoided as for ammonia vapors. ( Threshold limit value for ammonia is 25 parts per million. )

Eye protection should be worn when handling the product and splashes on the skin or in the eye should be removed at once with plenty of clean water, Casual contact and spillages, etc., should be dealt with as for ammonia. The area should be ventilated to clear fumes and any splashes on the person removed immediately with plenty of clean water.

## SAFETY IN USE

200L Iron Drum ( 200Kg )



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