

RHOPLEX™ TR-407 Firm, Mechanically Stable, Acrylic Binder for Nonwovens

Description

RHOPLEX TR-407 is recommended for bonding nonwovens where an extremely firm, resilient, durable binder is needed such as in hospital and medical applications, interlinings, household furnishings, and highloft webs. It can be blended with softer binders to provide an intermediate hand while maintaining good strength and durability. This aqueous, all-acrylic emulsion also has excellent resistance to yellowing at high temperatures. Its outstanding mechanical stability improves sprayability and ensures even resin distribution and penetration.

In summary, the features of RHOPLEX TR-407 are:

- High tensile strength
- Excellent durability to washing
- Good durability to drycleaning
- Resiliency
- Outstanding mechanical stability
- Firm hand
- Excellent resistance to yellowing

Performance Properties

The excellent performance of RHOPLEX TR-407 on polyester and rayon webs is shown in Table 1. The webs were carded, bonded and can dried on a commercial line.

**Table 1 -
Performance of RHOPLEX TR-407
On Nonwoven Webs**

	Carded Polyester 30/70 binder/fiber ratio 1.5 denier/1.5 inch staple (DuPont 54W)	Carded Rayon 30/70 binder/fiber ratio 1.5 denier/2 inch staple (American Enka)
Basis weight, oz/sq yd	0.89	1.05
Thickness (bulk), mil	10.0	7.0
Brightness, %	84.0	74.8
Tensile strength, g/inch width (MD/CMD)*		
Dry	7160/950	4990/1130
Water wet	6940/1000	2360/450
Isopropanol wet	5530/300	6620/820
Perchloroethylene wet	4630/320	5850/680
Mullen burst strength, psi	24.5	22.8
Elongation, %	19.3	6.7
Wash durability, 10 cycle test, cycles passed	10	10
Dryclean durability, 5 cycle test, commercial cycles passed	5	5
Absorbency rate, sec	2	27
Absorptive capacity times its own weight	7.8	6.0

*Corrected to 1.0 oz/sq yd basis weight

Color Stability

As can be seen in Table 2, films of RHOPLEX TR-407 do not discolor at high processing conditions as do those of competitive products. This lack of color is especially important in light colored apparel.

Table 2 - Color Stability of RHOPLEX TR-407 Films

	Film Color Following Curing 5 minutes @			
	300°F (149°C)	350°F (177°C)	375°F (190°C)	400°F (204°C)
RHOPLEX TR-407	clear	clear	clear	slightly yellow
Vinyl acrylic latex	bluish	bluish	slightly yellow	yellow
PVA latex	clear	slightly yellow	yellow	yellow

Formulation

Thermosetting Resin

RHOPLEX TR-407 is a self-crosslinking emulsion which does not need an external crosslinker to achieve durability to washing and drycleaning. Self-reactive sites are built into this latex polymer which can crosslink with a combination of time and heat. When increased durability is desired, an external crosslinker such as Aerotex M-3 or Cymel 303 can be used at 0.5 to 10% solids on binder solids.

Catalyst

The time and temperature required to dry and cure nonwovens bonded with RHOPLEX TR-407 depends on many factors. Fiber type, formulation, method of application, and drying and curing equipment are some of the variables that will affect the rate of crosslinking (i.e., cure). The actual rate of crosslinking is best determined under actual production conditions.

In applications requiring a faster rate of crosslinking, or where less than optimum curing conditions exist, the addition of an acid or latent acid catalyst will increase the rate of crosslinking of RHOPLEX TR-407. The following catalysts are recommended with this binder:

Catalyst	Concentration (solids on emulsion solids)	Comment
oxalic 10% acid	0.5%	Add as a solution
ammonium 25% nitrate	1.5%	Add as a solution

Defoamer

If needed, a defoamer such as Foamaster DF-160L is recommended with RHOPLEX TR-407. This product should be used at a starting level of 0.05 to 0.1% (product as supplied) on the total weight of the formulation. Prior to use, any defoamer should be pre-emulsified with at least an equal weight of warm water and added to the emulsion, under agitation, before other ingredients.

Surfactant

A nonionic surfactant, such as Triton X-114, is recommended in the formulation to achieve better wetting of the fibers. This surfactant should be used at a starting level of 0.5% solids on polymer solids and diluted with at least 3 times its weight of warm water before being added. An anionic surfactant, such as Triton GR-5M, should be used where rewetting properties in the end product are desirable. The same solids level and predilution as with Triton X-114 are recommended.

pH

The pH of the formulation should be adjusted to 8.0 to 8.5 with a volatile base such as ammonium hydroxide to ensure good runnability.

Starting Point Formulations

The following interlining formulation is offered as a starting point and can be modified for your application. For specific applications, recommendations will be provided upon request.

Interlining Formulation

Ingredients in Order of Addition	Parts Product by Weight (as supplied)	Parts Product on Solids Basis
Water	67.14	--
Foamaster DF-160L (premix)	0.05	0.05
Warm water	0.05	--
Triton X-114 (premix)	0.07	0.07
Warm water	0.21	--
Cymel 303	0.30	0.29
RHOPLEX TR-407	31.30	14.26
Ammonium nitrate (25%)	0.88	0.22
Ammonium hydroxide	to pH 8.0 to 8.5	
Total	100.00	14.89

Typical Properties

These properties are typical but do not constitute specifications.

Appearance	Milky white liquid
Type	Self-crosslinking acrylic
Ionic Charge	Anionic
Solids Content, %	45.5
pH (as packed)	2.5
Brookfield Viscosity at 25°C, cP (# 1 spindle, 60 rpm)	20
Glass Transition Temperature, Tg, °C (DSC method)	34
Minimum Film Formation Temperature, MFFT, °C	22
Density, 25°C	
lb/US gal	8.9
kg/l	1.07

Source of Raw Materials

Aerotex M-3	Thermosetting resin	Freedom Textile Chemicals Charlotte, NC
Ammonium nitrate (54%)	Catalyst	William M. Barr Co. Memphis TN
Cymel 303	Thermosetting resin	Cytec Industries, Inc. Plainfield, NJ
Foamaster DF-160L	Defoamer	Henkel Corp. Textile Division Charlotte, NC
Triton GR-5M Triton X-114	Surfactants	Union Carbide Corp. Danbury, CT

Material Safety Data Sheets

Rohm and Haas Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products.

Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS on any hazardous products in their workplace.

Rohm and Haas Company sends MSDS on non-OSHA-hazardous as well as OSHA-hazardous products to both the "bill to" and "ship to" locations of all our customers upon initial shipment (including samples) of all our products (whether or not they are considered OSHA-hazardous). If you do not have access to one of these MSDS, please contact your local Rohm and Haas representative for an additional copy. Updated MSDS are sent upon revision to all customers of record. In addition, MSDS are sent on an annual basis to all customers of record.

MSDS should be obtained from your suppliers of other materials recommended in this bulletin.

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