Tecnoflon® TN Latex

Specialty Grade

Tecnoflon® TN Latex is a highly concentrated water based emulsion of a fluoroelastomer terpolymer. Tecnoflon® TN Latex is solvent free and therefore can be an “environmental friendly” alternative for solvent based fluoroelastomer dispersions. Tecnoflon® TN Latex can be used for coating applications whenever superior chemical resistance and excellent thermal stability are required. It can be applied by spraying, dipping or using any other conventional coating technology.

Some of the unique properties of Tecnoflon® TN Latex are:

- Solvent free
- High concentration
- High fluorine
- Shelf stability over several months*
- Superior chemical resistance to most solvents and chemicals
- High temperature resistance (continuous operating temperature at 200 °C/392 °F)

** Refer to storage recommendations for more information*

Tecnoflon® TN Latex can be used to make rubber coated fabrics, protective gloves, fiber impregnation, protective films over lower chemical resistance substrate or to reduce friction and, in general, in any coating or impregnation application where chemical resistance and/or thermal stability are critical factors.

Although Tecnoflon® TN Latex is resistant to most of the commonly used solvents and chemicals, it is not resistant to ketones, esters and low molecular weight polar solvents.

Properties of Tecnoflon® TN Latex are:

Property	Unit	Typical Value
Appearance and odor		White liquid
Solids by weight	%	70 ca.
Fluorine content of the polymer	%	68
Specific gravity		
Latex		1.45
Polymer		1.86

Handling and safety

Normal care and precautions should be taken to avoid skin contact, eye contact and breathing of fumes. Smoking is prohibited in working areas. Wash hands before eating or smoking. For complete health and safety information, please refer to the material safety data sheet.

Storage

Shelf life:
While the shelf life of Tecnoflon® TN Latex, can be several months, the pot life of the compounded material can be from few to several weeks depending upon the compound recipe.

To avoid some problems with pot life, the curing system should be kept separate from the polymer by using the two components’ approach described in the following.

Temperature:
Tecnoflon® TN Latex and related compounds should be stored between 5 °C (41 °F) and 25 °C (77 °F).

Stirring:
It is important that Tecnoflon® TN Latex and related compounds are agitated periodically (once a week) to prevent settling.

Compounding suggestions

Ingredients:

Tecnoflon® TN Latex is usually mixed with some ingredients both to meet specific requirements and to enhance the chemical and thermal stability of the product.

- Curing agents
- Acid acceptor
- Fillers
- Pigments
- Emulsifier

Unless otherwise specified, ingredients levels and recipes are given in hundred grams of ingredient per hundred parts of dried polymer (phr).

Curing agents:

Tecnoflon® TN Latex does not contain curatives; therefore, a curing agent should be used to improve physical properties, thermal stability and chemical resistance. Tecnoflon® TN Latex is usually cured with polyamines (di, tri and tetramines). Here below are listed some amines that can be used to cure Tecnoflon® TN Latex.
The proper level and the right one should be chosen based on the application and the requirements on the final product.

- N,N'-Dicinnamilylidene-1,6 Hexanediamine (suggested level 2.5 to 5 phr)
- Hexamethylene diamine Carbamate (suggested level 1 to 3 phr)
- Triethylene Tetramine (TETA) (suggested level 1 to 3 phr)

Acid acceptor:

The curing mechanism develops some acidity that needs to be absorbed by an acid acceptor. Zinc oxide (suggested level 8 to 15 phr) is recommended in Tecnoflon® TN Latex since other metal oxide or hydroxide can cause coagulation due to their high pH.

Fillers:

The physical properties of Tecnoflon® TN Latex can be improved by the addition of reinforcing fillers. Not all the fillers are suitable. These are some constraints:

- pH should not be lower than 5 or higher than 8
- High specific gravity fillers should be avoided since they tend to settle down
- Unless in a water pre-dispersed form, Carbon black should be avoided since they are difficult to disperse

Clays and silicates such as Neuburg Clay or Calcium Metasilicate are recommended in a level that can vary from 0 to 30 and sometimes 40 phr.

Pigments:

Metal oxides such as Iron oxide, Titanium dioxide or Chromium oxide can be used as pigments when a color different than black is required.

Emulsifiers:

Better dispersion of fillers, acid acceptors and curing agents into the Tecnoflon® TN Latex can be obtained by using a two components approach.

All the ingredients but Tecnoflon® TN Latex should be premixed using an adequate amount of water. To facilitate the premixing and improve dispersion of acid acceptor and fillers one of the below listed emulsifiers may be used:

- Sodium, Potassium, or Ammonium Laurylsulphate (max. 1 phr)
- Triton® X100 – Rohm and Haas (max. 3 phr)

Formulations:

The following are some of the factors which should be considered when developing a recipe based on Tecnoflon® TN Latex.

- Production technology availability
- Proprietary technology knowledge

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Typical formulation

Table 1: Example of Tecnoflon® TN Latex compounds

Compound Recipe	Unit	A	B	C
Tecnoflon® TN Latex	phr	145	145	145
ZnO	phr	10	10	10
TETA	phr	1.5	2.5	1.5
Nyad® 400*	phr	20	20	
Sodium Lauryl Sulphate	phr	1	1	1
Cr_2O_3	phr	5	5	5

** Calcium Metasilicate produced by Nyco*

Processing

Mixing procedure:

1. Mix the zinc oxide and the emulsifier with equal amount by weight of water to make a well dispersed paste. (Dispersion of zinc oxide is critical for a smooth film surface).
2. Fillers, pigments and the curative should be mixed together using the procedure described above.
3. When ready for processing, add the two pastes of Tecnoflon® TN Latex using a gentle stirring. If foam occurs, a maximum of 0.5 phr of antifoaming BYK® 3105 (BYK Chemie) or equivalent can be added.

The solid content of the compound prepared as described above will be roughly 50 %.

Application procedure:

The thickness that can be applied over a substrate in one single pass depends on the viscosity and therefore on the solid content of the compound. The higher the solid content, the higher the thickness. (The nature of fillers and other ingredients can have an effect as well but in much lower extent). As an example, dipping a ceramic form in compound A of Table 1, a thickness of 0.5 mm (20 mils) can be achieved. If more than one pass is required, the material should be dried between coats.

Coagulant:

In some applications a coagulant is required to increase the thickness that can be applied in one pass. In such case the following chemicals can be used as well as, in some cases, other normally used coagulants.

- Potassium or Ammonium Nitrate
- Aluminium Sulphate

Drying:

A slow to moderate drying is recommended to avoid bubbling and “orange skin” effects. For such reason, a temperature not higher than 60 °C (140 °F) should be used.

Curing:

Curing time and temperature are strongly related to the amine used and its quantity. As an example, a compound containing 1.5 phr of TETA can be cured at 90 °C (194 °F) per one hour.

A compound with 4 phr of Tecnoflon® Tecnocin A will require 6 hours. Since also physical properties are strongly related to the amine used and its quantity, which amine and quantity should be used has to be determined case by case, according to final product requirements and/or economical considerations.

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Physical properties

The following physical properties were determined on 1 mm (25 mils) film dried at 60 °C (140 °F) per one hour (Table 2) and for two hours (Table 3). The compound recipe is the one showed in Table 1.

Table 2: Typical physical properties after curing 1h at 90 °C

Compound	Unit	A	B	C
100 % Modulus	MPa	1.4	2.0	0.8
Tensile strength	MPa	3.1	4.5	2.9
Elongation at break	%	700	300	800

Table 3: Typical phyisical properties after curing 2h at 90°C

Compound	Unit	A	B	C
100 % Modulus	MPa	1.4	2.3	5.2
Tensile strength	MPa	3.3	5.1	5.2
Elongation at break	%	550	250	650

Post curing

Sometimes, especially when high temperature resistance are required, a post cure (after regular cure) at high temperature is recommended.

Table 4: Typical physical properties after curing 1h at 50 °C and post cure 1h at 250 °C

Compound	Unit	A	B	C
100 % Modulus	MPa	3.3	5.3	2.3
Tensile strength	MPa	6.5	6.1	6.2
Elongation at break	%	330	180	450

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