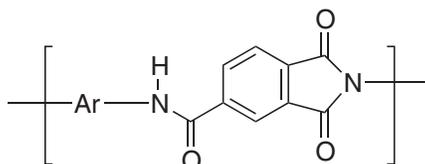


Polyamide-imide Powders for Membranes

Molded and machined components made from TORLON polyamide imide (PAI) are recognized in a number of industries for their unstoppable performance under extreme conditions. This remarkable polymer combines exceptional strength at high temperatures – up to 260°C (500°F) – with excellent resistance to creep, wear, and chemicals including organic solvents. Powdered forms of TORLON PAI can bring these same benefits to high-performance membranes.

TORLON 4000T

TORLON 4000T polyamide-imide is made from trimellitic anhydride chloride and a mixture of aromatic diamines and has the generalized chemical structure shown below.



It is sold as a powder and is soluble in dipolar aprotic solvents such as N-methylpyrrolidone (NMP), dimethylacetamide (DMAC), dimethylformamide (DMF), and dimethylsulfoxide (DMSO).

TORLON 4000TF

TORLON 4000TF is chemically identical to 4000T, but the particle size is smaller. The particle size range is from 1 to 150 microns with 95% of the particles less than 75 microns.

TORLON AI-50

AI-50 is the partially imidized analog of 4000T. It is sold as a wet powder with about 65% water. It can be made water soluble by forming the ammonium salt with triethylamine. A dry version can be supplied upon request.

Heat Treatment or Curing

The mechanical properties of polyamide-imide articles can be greatly improved by heat treating or curing. This is illustrated in Table 2 using injection molded test specimens approximately 3 mm (1/8") thick. The heat treatment was done by putting the specimens in a forced air oven and increasing the temperature to 260°C and holding them at that temperature for an extended time. Thinner items such as membranes, films, or coatings can be cured much more rapidly.

In addition to increasing the molecular weight by chain extension, it is likely that a small amount of branching and/or crosslinking occurs during the heat treatment.

Table 1

Typical Properties⁽¹⁾ of TORLON PAI Powders

Property	4000T	4000TF	AI-50
Appearance	Yellow powder	Fine yellow powder	Wet yellow powder
Solids Content, %	99	99	35
Solution Viscosity - 25% in NMP, cp	2000	2000	
Solution Viscosity - 7% in water ⁽²⁾ , cp			16
Acid Number ⁽³⁾ , mgKOH/g	10	10	125
% imidized	95	95	15-20

⁽¹⁾ Typical properties, actual properties of individual batches will vary within specification limits

⁽²⁾ Water solution of triethylammonium salt

⁽³⁾ Per gram of polymer solids

Table 2**Typical Properties on Injection Molded TORLON 4000T PAI**

Property	ASTM Method	Units	Typical Values ⁽¹⁾	
			As Molded	After Cure ⁽²⁾
Glass Transition Temperature	D 3417	°C	272	280
Heat Deflection Temperature	D 648	°C	242	281
Specific Gravity	D 792		1.36	1.36
Tensile Strength	D 638	kpsi (MPa)	11.0 (76)	21.2 (146)
Tensile Elongation	D 638	%	2.0	6.0
Tensile Modulus	D 638	kpsi (GPa)	620 (4.3)	544 (3.8)
Flexural Strength	D 790	kpsi (Mpa)	15.8 (109)	26.4 (182)

⁽¹⁾ Typical properties, actual properties of individual batches will vary within specification limits.

⁽²⁾ Cure schedule- 1 day 149°C, 1 day 190°C, 1 day 204°C, 1 day 218°C, 1 day 232°C, 1 day 243°C, 1 day 252°C, 10 days 260°C.

Standard Packaging and Labeling

TORLON powdered resins are packaged in lined cardboard boxes or fiber drums containing 150 lbs (68 kg), 50 lbs (22.7 kg), or 15 lbs (6.8 kg) of material depending on grade. Special packaging can be supplied upon request. Individual packages will be plainly marked with the product number, the lot number, and the net weight.

Precautionary Labeling

On the basis of the toxicological, physical, and chemical properties of TORLON powdered resins, labeling used on containers is as follows:

Caution! Handling and/or processing this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose, and throat.

Product Safety and Emergency Service

For product safety information or a Material Safety Data Sheet on a product of Solvay Advanced Polymers

1 (800) 621-4557

1 (770) 772-8880 outside of U.S.

For information or help in an emergency such as a spill, leak, fire or explosion, call day or night:

Emergency Health Information

1 (800) 621-4590

1 (770) 772-5177 outside of U.S.

Emergency Spill Information

CHEMTREC 1 (800) 424-9300

1 (703) 527-3887 outside of U.S.

collect calls accepted

For Additional Information

Technical Service

1 (800) 621-4557

Customer Service

1 (800) 848-9744

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