

## General information

### Overview

These were introduced due to the inability of PI to be processed by conventional thermoplastics techniques.

### Strengths

Exceptional creep resistance up to reasonably high temperatures, 150 °C (300 °F), exceptionally high heat distortion temperature, excellent radiation, and solvent resistance - good for sterilizing. Properties approach those of PI, but PAI is melt processable. Highest tensile strength of any unreinforced thermoplastic (the same as SRP), good wear resistance (better than PI), low smoke emission, low coefficient of linear thermal expansion, good fatigue resistance.

### Limitations

Water absorption leads to a reduction in heat distortion temperature (after submerging for 3 months this drops by 100 °C (210 °F)). Poor resistance to alkalis, attacked by water/water vapor at elevated temperatures.

### Designation

Polyamideimide, Polyamide imide

### Tradenames

Torlon, Vylomax

### Typical uses

Constructional parts under mechanical or electrical loads up to 260 °C (500 °F), e.g. impellers for hydraulic pumps. Valves, bearings, electrical connectors, gears, parts for jet engines and internal combustion engines, printed circuit boards.

## Composition overview

### Compositional summary

$(-N[CO]_2C_6H_3-CONH-R)_n$

#### Material family

Plastic (thermoplastic, amorphous)

#### Base material

PAI (Polyamide-imide)

### Effect of composition

Processability can be improved by mixing with low-viscous engineering thermoplastics such as PSU, PEI, PA, PPS, and PC.

## Processing properties

### Feedstocks & production

A diisocyanate, usually 4,4'-methylenediphenyldiisocyanate and trimellitic anhydride. Starting materials must be of high purity.

#### First commercial production

1972

### Forming

Compression molding, injection molding, extrusion. Very high melt temperatures (above 355 °C (670°F)). Prolonged annealing cycles needed for high-quality moldings and increased wear resistance (192 hr for a 12 mm thick sample, 48 hr for 3 mm thick). Pre-drying for 8-16 hr required. Injection molding difficult.

### Machining

Very easy to machine (easier than PEEK).

### Joining

Very difficult to solvent bond, suitable for bonding with epoxies (other common adhesives not recommended). Suitable for painting. Suitable for welding though hot gas difficult (radio freq. Not possible). Suitable for snap-fit assemblies due to good fatigue strength, pre-tapping necessary for screws, low coefficient of thermal expansion allows for metal inserts.

### Surface treatment

Suitable for painting.