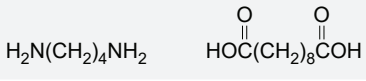
PA-4,10 polyamide-4,10

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	poly(tetramethylene sebacamide), polyamide-4,10	
Acronym	-	PA-4,10	
CAS number	-	26247-06-3	
SYNTHESIS			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	110-60-1; 111-20-6	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	88.15; 202.25	
Method of synthesis	-	in the first step a low molecular weight prepolymers with M_n=1000–2000 g mol^{-1} are synthesized to obtain a concentrated aqueous solution of prepolymers; after isolation of the prepolymers, the solid state post-condensation is performed at a temperature of about 35°C below the corresponding T_m until the desired molecular weight is reached	Koning, C; Teuwen, L; de Jong, R; Janssen, G; Coussens, B, High Perform. Polym., 11, 387-94, 1999.
Number average molecular weight, M_n	dalton, g/mol, amu	17,200	
Chain-end groups	meq g^{-1}	NH_2 – 0.02; COOH – 0.058	Koning, C; Teuwen, L; de Jong, R; Janssen, G; Coussens, B, High Perform. Polym., 11, 387-94, 1999.
STRUCTURE			
Cell type (lattice)	-	triclinc	
Cell dimensions	nm	a:b:c=0.49:0.532:1.98 (α); a:b:c=0.49:0.800:1.98 (β)	Jones, N A; Atkins, E D T; Hill, M J; Cooper, S J; Franco, L, Polymer, 38, 11, 2689-99, 1997.
Unit cell angles	degree	α:β:γ=49:77:63 (α); α:β:γ=90:77:66 (β)	Jones, N A; Atkins, E D T; Hill, M J; Cooper, S J; Franco, L, Polymer, 38, 11, 2689-99, 1997.
Polymorphs	-	α, β	Jones, N A; Atkins, E D T; Hill, M J; Cooper, S J; Franco, L, Polymer, 38, 11, 2689-99, 1997.
Rapid crystallization temperature	°C	210	
Avrami constants, k/n	-	n=2.0-3.3	
COMMERCIAL POLYMERS			
Some manufacturers	-	DSM	
Trade names	-	EcoPaXX	
PHYSICAL PROPERTIES			
Density at 20°C	g cm^{-3}	1.09 (dry); 1.34-1.52 (30-50% glass fiber, dry)	
Odor	-		
Melting temperature, DSC	°C	249-250 (dry); 250 (30-50% glass fiber, dry)	
Heat deflection temperature at 1.8 MPa	°C	77 (dry); 215-220 (30-50% glass fiber, dry)	
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	135-220 (30-50% glass fiber, dry); 115 (30-50% glass fiber, conditioned)	

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PARAMETER	UNIT	VALUE	REFERENCES
Tensile modulus	MPa	3,100-3,160 (dry); 1,700-1,840 (conditioned); 9,500-16,000 (30-50% glass fiber, dry); 7,000 (30-50% glass fiber, conditioned)	
Tensile stress at yield	MPa	82-85 (dry); 61 (conditioned)	
Elongation	%	10-16 (dry); 32 (conditioned); 2.5-4 (30-50% glass fiber, dry); 5.8 (30-50% glass fiber, conditioned)	
Tensile yield strain	%	5 (dry); 3 (30-50% glass fiber, dry)	
Charpy impact strength, unnotched, 23°C	kJ m^{-2}	NB; 40-80 (30-50% glass fiber, dry); 80 (30-50% glass fiber, conditioned)	
Charpy impact strength, unnotched, -30°C	kJ m^{-2}	NB; 60 (30-50% glass fiber, dry)	
Charpy impact strength, notched, 23°C	kJ m^{-2}	5-7 (dry); 13 (conditioned); 11-15 (30-50% glass fiber, dry); 15 (30-50% glass fiber, conditioned)	
Charpy impact strength, notched, -30°C	kJ m^{-2}	4 (dry); 9-12 (30-50% glass fiber, dry)	
Shrinkage	%	0.4-1.1 (30-50% glass fiber, dry)	
Moisture absorption, equilibrium 23°C/50% RH	%	2-2.24; 1.5 (30-50% glass fiber, dry)	
CHEMICAL RESISTANCE			
Greases & oils	-	good	
Other	-	hot water, salt	
FLAMMABILITY			
UL 94 rating	-	V-0 (30-50% glass fiber, dry)	
PROCESSING			
Typical processing methods	-	injection molding	
Preprocess drying: temperature/ time/residual moisture	°C/h/%	80/4-8/0.1	
Processing temperature	°C	240-275	
Additives used in final products	-	release agent	
BLENDS			
Compatible polymers	-	PLA	