

DATA

Physical properties of Polyamid 12 coatings

Properties	Test method	Unit	Value
Melting temperature	ISO 3146	°C	176
Density 23 °C	ISO 1183	g/cm ³	1.016
Shore hardness D	ISO 868		75
Ball indentation hardness H30	ISO 2039-1	N/mm ²	90
Tensile test:			
Stress at yield	ISO 527-1/-2	MPa	43
Strain at yield		%	6
Stress at break		MPa	49
Strain at break		%	311
Water absorption			
100 °C, immersion	ISO 62	%	1.93
23 °C, 96 % rh.			1.33
23 °C, 50 % rh.			0.52
Thermal linear expansion	ISO 11359	10 ⁻⁴ K ⁻¹	1.09
Thermal conductivity	referring to DIN 52612	W m ⁻¹ K ⁻¹	0.23-0.29
Specific heat	DIN 53765	J g ⁻¹ K ⁻¹	2.35
Abrasion	DIN 53754 (Taber)	mg/100 turns	14

Electrical properties of Polyamid 12 coatings

Properties	Test method	Unit	Value	
			dry	wet*
Relative permittivity 23 °C / 1 MHz	IEC 60250		3.8	6.7
Dissipation factor 23 °C / 1 MHz	IEC 60250		5 × 10 ⁻²	17 × 10 ⁻²
Volume resistivity	IEC 60093	Ω cm	7 × 10 ¹⁴	3 × 10 ¹²
Breakdown voltage	IEC 60243-2	kV	12-14	
Electric strength K20/P50	IEC 60243-1	kV/mm		92

* after immersion in water at 23 °C



Environmental Aspects Polyamid 12

Physiological and toxicological evaluation

The department of Environment, Health and Safety, responsible for the High Performance Polymers Business Unit, provides a survey of the toxicological properties of Polyamid12 powders or evaluations relating to contact with foods. This department is also responsible for providing information on product safety and writing EC safety data sheets for Polyamid12. Please send inquiries, also for US Material Safety Data Sheets, to the contact addresses provided.

Following the harmonization of European laws and ordinances, new regulations have come into effect regarding plastics intended to come into contact with foodstuffs. The Polyamid12 polyamide 12 powders have been approved by the European Community for direct contact with foodstuffs, since the basic monomer laurolactam is positively listed in the Directive 90/128/EEC. With the sixth amendment 2001/62/EC of August 2001, the directive specifies a migration value limit of 5 milligrams per kilogram for laurolactam, which must be tested on the finished article itself and be kept within limits there.

According to 21 CFR, § 177.1500 (Nylon Resins), of the Food and Drug Administration (FDA), PA 12 powder is currently licensed in the U.S. for coatings for repeated use. The license excludes contact with alcohol-containing foods and beverages.

Directive 93/42/EEC applies to the use of materials in medical applications within the European Community. In August 1994, this directive was incorporated into German law by passage of the Medizinproduktegesetz (Medical Devices Act). The pertinent international and national standards, such as ISO 10993 and DIN EN 30993-1, cover the details of the approval process. The most current Deutsche Arzneibuch (DAB) (German Pharmacopoeia) and European Pharmacopoeia, Eur. Ph., current edition 1998, can be used as supplementary regulatory works to make the decision in special cases. In cases of doubt, workpieces shall be tested by the manufacturer or user under the conditions of use.

Environmental impact and safety

Polyamid12 powders are non-toxic, not subject to labeling under the hazardous materials regulation and are not water-polluting. They can be disposed of in landfills or incinerated as normal household waste in accordance with local ordinances. The EC Safety Data Sheet for Polyamid12 provides further instructions.

If Polyamid12 powders are properly processed, no hazardous byproducts are formed. Cadmium-containing pigments are not used at all.

Polyamid12 powders are combustible. At mass temperatures above 350 °C, flammable gases are formed by degradation. Combustion with sufficient air supply yields CO, CO₂, H₂O and nitrogen-containing compounds as end products. Since the spectrum of cracking and combustion products greatly depends on the combustion conditions, it is not possible to make any general statements here.

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Chemical Resistance of Polyamid 12

Medium	Concentration [%]	Test duration and temperature	
		6 month/20 °C	4 weeks/60 °C
Acetic acid	10	++	-
Acetone (b.p. 56.3 °C)	100	++	++
Ammonia, aq	conc.	++	++
Aniline	100	+	
Anti-freeze		++	+
Apple juice		++	++
Asphalt		++	++
Barium salts		++	++
Battery acid		±	--
Beer		++	
Benzene	100	++	±
Brake fluid		++	++
Butane, gaseous	100	++	++
Butane, liquid	100	++	
Butter		++	
Caustic potash	50	++	++
Caustic soda	50	++	++
Chlorine, liquid	100	--	--
Chrome plating solutions (commercial)		--	--
Chromic acid	20	--	--
Citric acid, aq.	c.s.	++	±
Coffee, ready for drinking		++	
Cyclohexanone	100	++	±
Detergent solutions ¹⁾	ready for use	++	++
Dibutyl phthalate (VESTINOL® C)		++	++
Diethyl ether (b.p. 35 °C)	100	+	
Dioctyl phthalate (VESTINOL® AH)		++	++
Dishwashing agents	ready for use	++	++
Edible oils (animal or vegetable)		++	++
Ethyl acetate		++	-
Ethyl alcohol, not denatured	100	++	+
Fish		++	
Formic acid	10	++	++
Fuel oils	100	++	++
Glycerin	100	++	++
Glycol	100	++	++
Hydrochloric acid	10	--	--
Hydrofluoric acid	40	-	-
Hydrogen peroxide, aq	30	++	



Chemical Resistance of Polyamid 12

Medium	Concentration [%]	Test duration and temperature	
		6 month/20 °C	4 weeks/60 °C
Lactic acid, aq	10	+	±
Lemon juice		++	++
Linseed oil		++	++
Magnesium salts, aq		++	++
Methanol	100	++	+
Methyl ethyl ketone	100	++	±
Milk		++	++
Nitric acid	10	--	--
Ozone (0.5 ppm)		±	
Paraffin oil	100	++	++
Petrol		++	++
Petroleum	100	++	++
Potassium chlorate, aq	c.s. (7.3)	+	±
Potassium permanganate, aq	c.s. (6.4)	-	--
Propane, gaseous	100	++	++
Pyridine	100	++	
Rum	40	++	++
Sea water		++	++
Silicon oils		++	++
Sodium chloride, aq (common salt)	c.s.	++	++
Sodium hypochlorite, aq	5	+	-
Soft soap		++	++
Sugar solutions	any	++	++
Sulphur	100	++	++
Sulphuric acid	10	+	-
Toluene	100	++	-
Tomato juice		++	++
Trichloroethylene	100	±	-
Water	100	++	++
Whisky	40	++	
Xylene	100	++	±

Key to symbols:

Resistance levels

++	=	resistant	Concentrations	
+	=	almost resistant	aq	= aqueous solution
±	=	limited resistance	c.s.	= cold saturated
-	=	low resistance	¹⁾ tested Dixan® and Persil®	
--	=	not resistant		