

Ultramid® 1C

A clear case for coatings



Ultramid® in the web: www.ultramid.de

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Ultramid® 1C

The soluble polyamide for tough, abrasion-resistant coatings and coverings with high oxygen barrier

Ultramid® 1C is a product from the BASF polyamide line, which enjoys worldwide recognition. Subtle variation of monomer building blocks produces a co-polyamide which combines the exceptional properties of Ultramid® with simple processing from solution.

Applied from solution – or incorporated into components which cure or crosslink thermally, Ultramid® 1C forms flexible, scratch-resistant coatings or tough, resilient, abrasion-resistant coverings on plastics, films, nonwovens, fabrics, leather, paper, wood or metal.

The colorless coverings provide an excellent oxygen barrier, and they can be pigmented as desired.

They are resistant to a wide variety of solvents like aromatic and aliphatic hydrocarbons, halogenated hydrocarbons, acetone, cyclohexanone, tetrahydrofuran and ethyl acetate, as well as to fuels, oils, fats, plasticizers, fruit juices, and dilute fruit acids.

Physical properties

The product is a polyamide co-polymer, available as glass-clear pellets with a bulk density of 575-675 g/l. Residual moisture is generally below 2% by weight. The usual polyamide viscosity number to ISO 307 measured in 96% sulfuric acid provides a measure of molecular weight and is 122 ml/g. Density determined at 20 °C to ISO 1183 is 1.106 g/ml. The product melts at 185 °C (BASF test method PM 025) and the glass transition temperature of the dry material is about 73 °C. A 20% solution in n-propanol:water = 8:2 is relatively viscous at 1,200 MPa·s (DIN 53019/DIN 53214, 23 °C) – but this polymer solution is easy to handle. Hazen color value for the same solution (DIN ISO 6271) is less than 100. Oxygen permeability P (cm³ · 100 μm/m² · d · bar) is 15.

Mechanical properties

Ultramid® 1C is mainly applied from solution in the form of a film. The properties of the film depend greatly on the application technique and the substrate material. The values in Table 1 were determined on injection-molded test specimens made from Ultramid® 1C. They are intended as guidelines for estimating the performance of films.

Tensile modulus of elasticity	dry	2,400 MPa	ISO 527
	wet	1,400 MPa	
Yield stress	dry	80 MPa	ISO 527
	wet	48 MPa	
Elongation at yield	dry	5%	ISO 527
	wet	5%	
Flexural modulus of elasticity	dry	2,300 MPa	ISO 178
	wet	1,400 MPa	
Flexural stress	dry	100 MPa	ISO 178
	wet	47 MPa	
Charpy impact strength	dry	150 kJ/m ²	ISO 179/1eU
	wet	no break	
Ball indentation hardness		115 MPa	ISO 2039/1

Table 1: Mechanical values of Ultramid® 1C

Solubility and swellability of Ultramid® 1C coatings

The coverings or films are resistant to most commonly used solvents. However, they are attacked and dissolved by alcohols, methylene chloride, concentrated mineral acids, and formic acid.

The chemical resistance of coatings can be estimated from increase in weight after storage trials in various media at 20 °C. The guideline values in Table 2 will be useful here.

Medium	Weight increase at saturation [%]
Water	15.0-17.0
Ammonia (10 %)	13.5
Soda (5%)	12.5
Sodium chloride (10 %)	12.0
Sodium hydroxide (10 %)	9.5
Butanol	44.0
Glycol	36.0
Methylene chloride	36.0
Butyl acetate	16.0
Ethyl acetate	15.0
Tetrahydrofuran	15.0
Trichlorethylene	10.0
Terpentine	4.0
Acetone	3.5
Tetralin	3.0
Carbon tetrachloride	2.0
Benzene, toluene, xylene	<2.0
Cyclohexane	1.0
Gasoline, petroleum	<1.0
Palatinol AH, C	<1.0

Table 2: Weight increase of Ultramid® 1C

Storage

Ultramid® 1C can absorb moisture from the air and should therefore be carefully sealed and stored in dry conditions. Under appropriate conditions the material can be stored for at least a year.

Preparation of Ultramid® 1C solutions

Alcoholic solutions of Ultramid® 1C are generally prepared hot with reflux of the solvent mixture. Preferred solvent mixtures are ethanol/water and n-propanol/water – in each case in a ratio of 8:2 – or the pure alcohols. A good method involves adding Ultramid® 1C in portions to the solvent mixture, with stirring. The mixture is then heated to 60°C to 80°C and is stirred until the solution becomes clear.

This usually takes one to two hours. Stirring should be controlled so that the pellets do not agglomerate. A 20% solution is adequate for most applications.

Storage stability and viscosity of solutions

Depending on storage temperature, Ultramid® 1C content and solvent type, the solution gels after about 4 weeks (ethanol) or retains its stability for 24 weeks or more (n-propanol/water). The mixture can be reliquified by gentle heating and adding more solvent.

Viscosity of a 20 % Ultramid® 1C solution in n-propanol/water = 80:20 is about 1,200 MPa · s at 23°C. The solutions are newtonian at concentrations below 30 % and shear rates $D < 100 \text{ s}^{-1}$.

A clear case for coatings

Ultramid® 1C:

- is easy to apply
- has excellent electrical and mechanical properties
- gives a clear and robust film
- provides a good barrier against oxygen.

This makes Ultramid® 1C especially suited for wire bond coating in a wide field of applications ranging from mobile phones to e-motors.

Safety information

The preventive measures usual for chemicals apply, and include – in addition to compliance with guidelines provided by the appropriate industrial sectors – good workplace ventilation during processing of the product, good skin care, and good eye protection. The safety data sheet for Ultramid® 1C provides information on all data relevant to safety.

Based on our experience over many years and the information available to us, we do not expect any hazard to health to arise from appropriate handling and correct use of Ultramid® 1C.

Ultramid® 1C complies with the current legislation on plastics in contact with food in Europe, in the USA and China. If you need details on the food approval status, please contact BASF directly at: plastics.safety@basf.com.

Selected Product Literature for Ultramid®:

- Ultramid® – Product Brochure
- Ultramid® – Product Range
- Ultramid®, Ultradur® and Ultraform® – Resistance to Chemicals

Note

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (April 2016)

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If you have technical questions on the products,
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