



Ultramid[®] 1C

the soluble polyamide

Ultramid[®] in the web: www.ultramid.de

 **BASF**
The Chemical Company

Ultramid® 1C

A CLEAR CASE FOR COATINGS

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 copolyamide which combines the exceptional properties of Ultramid® plastics 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, and also to fuels, oils, fats, plasticizers, fruit juices, and dilute fruit acids.

PROPERTIES

Physical properties

The product is a polyamide copolymer, available as glass-clear pellets with bulk density 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 1200 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 below were determined on injection-molded test specimens made from Ultramid® 1C.

They are intended as guidelines for estimating the performance of films:

Tabelle 1:

Tensile modulus of elasticity	dry	2400	MPa	ISO 527
	wet	1400	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	2300	MPa	ISO 178
	wet	1400	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	kJ/m ²	
Ball indentation hardness		115	MPa	ISO 2039/1



Solubility/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 following guideline values will be useful here:

Table 2:	
Medium	Weight increase at saturation (%)
Water	15.0-17.0
Ammonia (10%ig)	13.5
Soda (5%ig)	12.5
Sodium chloride (10%ig)	12.0
Sodium hydroxide (10%ig)	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

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 the Ultramid® 1C in portions to the solvent mixture, with stirring. The mixture is then heated to 60-80 °C and is stirred until the solution becomes clear.

This usually takes 1-2 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 1200 mPa·s at 23 °C. The solutions are newtonian at concentrations below 30% and shear rates $D < 100 \text{ s}^{-1}$.

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. Ultramid® 1C is not a hazardous substance under Directive 91/155/EWG.

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 with less than 1% low-molecular-weight content complies with the relevant recommendations for polyamides issued June 15, 1992 in Report 188, German Federal Health Gazette 35, p. 362 (1992). The copolyamide supplied contains about 3% of soluble low-molecular-weight content, and this can easily be reduced below 1.0% by treatment with warm water.

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 2010)

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.

Please visit our websites:

BASF Plastics:

www.plasticsportal.com (World)
www.plasticsportal.eu (Europe)

Additional information on specific products:

www.plasticsportal.eu/name_of_product
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