VESTAGON® EP-SC 5050*

Catalyst for 1 - Uretdione based polyurethane powder coatings
2 - Matte hybrid powder coatings

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Preliminary

VESTAGON EP-SC 5050 is a catalyst that can be used in combination with 1) blocking agent free polyisocyanate adducts and hydroxyl-functional resins for polyurethanes and 2) matting hardeners based on salts of polycarboxylic acid plus cyclic amidines to enhance cure and gloss stability over the baking range of hybrid powder coatings. The product itself contains a tetraalkylammonium carboxylate adsorbed onto amorphous silica. The free flowing catalyst is delivered in the form of a very fine powder.

Specification

Property	Value	Unit	Test method
Nitrogen content	2.2 - 2.7	% wt	DIN 51 444
Water content	10 - 15	% wt	DIN 51 777/1

Typical properties

TAAC content	45	% wt	DIN 51444
Density	1.28	g/cm^3	DIN EN ISO 1183/1 Method B
Bulk density	435	kg/m^3	DIN EN 60
Flashpoint	96	°C	DIN EN ISO 2592
Ignition temperature	355	°C	DIN 51 794

Standard Procedures and Extrusion Conditions:

Premixing:	MTI-Mixer 2´-500 rpm
Application:	Manual spray gun 80 kV;
	Steel panels 0.8 mm
Curing:	Air-circulated Heraeus oven;
	Coating thickness 55-75

*EP = Experimental Product

We recommend the extrusion conditions as follows:
Coperion twin-screw extruder

Barrel temp.:	Zone 1 + 2 - 90°c
Screw speed:	250 r.p.m. (minimum)

The extrusion temperature must be selected to ensure that a mass temperature of minimum 110 °C is maintained. Otherwise, inadequate dispersion may result in reduced gloss and mechanical properties of the coatings especially in PUR systems.

1 - Low Temperature Polyurethane Powder Coatings

Application

This catalyst VESTAGON EP-SC 5050 provides significantly lower curing temperatures (down to 120°C) of polyurethane powder coatings in combination with blocking agent free polyisocyanate adducts and hydroxy functional resins. A prerequisite for that is the absence of any acidic groups during the reaction. Therefore an acid scavenger like oligomeric epoxides ***must*** be included in the formulation. The storage stability of these powder coatings may be somewhat restricted, depending upon the coating formulation. Numerous OH-terminated polyester and acrylics can be used to achieve weather-resistant decorative powder coatings with excellent physical properties. These polyols have a determining influence on the performance of the coating, as they affect physical properties, reactivity, storage stability and smoothness.

PUR powder coatings have been successfully used for many years with this new system which we expect to serve exterior and interior applications such as:

- Temperature sensitive materials
- MDF
- Sandwich constructions
- Metal alloys
- Heavy steel machinery
- Pre fabricated parts

Formulations

Crosslinker and polyester are normally used in equivalent amounts. This low temperature cure system however requires an excess of crosslinker due to the generation of isocyanurate bonds during cure, in addition to the standard polyurethane reaction.

Formulation Examples

Corresponding binder compositions in the formulation are listed in the following table, depending upon the polyester OH-value, the desired NCO:OH stoichiometric ratio of 1.2:1.0 to 1.7:1.0, and a catalyst level between 0.7 and 1.0 mmol/g NCO. To help calculate exact amounts of catalyst and other binder components, a low temperature cure calculator will be sent upon request. In addition, starting formulations with various commercial polyesters can be supplied, particularly with suggested polyesters that optimize powder stability, reactivity, and coating performance.

Examples of formulation for binder combinations

Crosslinking ratio (NCO:OH)	**1.4 : 1**			**1.7 : 1**			
VESTAGON EP-BF 9030 (NCO 12.5 %)	26.2	30.7	42.8	30.1	34.95	47.5	parts
Polyol (OH 40, Acid 5, mg KOH/g)	71.3	-	-	67.4	-	-	parts
Polyol (OH 50, Acid 5, mg KOH/g)	-	66.7	-	-	62.4	-	parts
Polyol (OH 85, Acid 5, mg KOH/g)	-	-	54.4	-	-	49.6	parts
VESTAGON EP-SC 5050 (0.7 mmol/g NCO)	1.08	1.26	1.71	1.19	1.41	1.91	parts
Acid scavenger (EEW 147 g/eq)	1.42	1.34	1.09	1.31	1.24	0.99	parts

Up to 1 % by weight degasser is often used in pigmented polyurethane powder coatings to minimize surface imperfections. The use of an acid scavenger is required to eliminate acidic groups to achieve a low temperature cure. VESTAGON EP-SC 5050 is a free flowing catalyst adsorbed onto silica, and has been proven to be a useful accelerator when used between 0.9 up to 3.0 % by weight based on the total binder. VESTAGON EP-BF 9030 itself contains no accelerator, which must be added to the formulation to achieve low temperature curing. EP-BF 9030 enhances the physical properties of polyurethanes when cured at low temperatures (120-150°C), due to its lower melting viscosity, and its ability to improve sintering during cure to form a continuous film at lower cure temperatures. VESTAGON EP-SC 5050 will also catayze formulations containing other VESTAGON BF crosslinkers for lower temperature cure powder coatings.

Curing

The curing temperature for low temperature powder coatings based on VESTAGON EP-BF 9030 plus VESTAGON EP-SC 5050 lies below the minimum cure temperatures of normal PUR powder coatings. A prerequisite for good physical properties of a coating is sufficient curing in the range of 120°C for 40 minutes up to 150°C for 10 minutes total oven time (formulation sensitive),

2 - Matte Hybrid Powder Coatings containing VESTAGON EP-SC 5050

Application

This catalyst VESTAGON EP-SC 5050 is designed for use in combination with matting hardeners based on salts of polycarboxylic acid plus cyclic amidines[1] in hybrid coatings only, where matte effects are desired with cure conditions of 150-200°C.

Since the introduction of the matting hardener and by virtue of its trouble free processability, matte coatings have gained ever increasing acceptance compared to high gloss counterparts.
As a feature heat sensitive substrates can now be coated with these catalysed matte hybrids.
Furthermore an outstanding advantage for the end-user will be avoiding gloss differentiations (patchwork appearance) when curing both light and heavy parts at the same time.

The decorative and attractive appearance makes these films desirable in coatings for:

- Metal furniture parts
- Domestic appliances
- Glass and ceramic articles
- Lighting fittings/fixtures
- Motor vehicle parts

Formulation and Curing

Matting of polyester-epoxy hybrid powders can be achieved with VESTAGON EP-SC 5050 but at reduced temperatures by replacing a small part of the binder while using above mentioned type of matting agent with the required ratio of epoxy to carboxyl resins.

Starting Formulation for a Typical 67:33 Matte Hybrid

Product	% wt.
Matting hardener[1]	4.50
VESTAGON EP-SC 5050	1.10
Epikote® 1055 (EW 806-909)	36.20
Crylcoat® 1716 (EW 1870)	17.80
Kronos® 2220	39.40
Resiflow® PV 88	1.00

Technical Coating Properties

The most important properties of the matted coatings are the gloss and the excellent levelling of the film. Color and physical properties of the film can be controlled with the aid of pigments or less expensive fillers depending on the use criteria.

Curing schedule °C - min	Gloss 60°	Cupping mm	Dir. Impact in - lb
200 - 8	9	8.0	120
180 - 12	9	8.0	100
170 - 20	9	7.8	90
160 - 30	9	6.3	50
150 -30	12	3.0	20

Storage and Packaging

The product is delivered in pails, net weight 10 kg. If kept cool (0-40°C) and **dry** in closed pails the product can be stored for at least 1 year in accordance to the specification. All opened pails should be carefully resealed immediately after use. Otherwise, the product may absorb atmospheric moisture.

Safety and Handling

Please refer to our Safety Data Sheet.

Evonik Resource Efficiency GmbH
Paul-Baumann-Str. 1
45764 Marl
Germany
PHONE +49 2365 49-02
FAX +49 2365 49-5030

www.evonik.com/crosslinkers
www.evonik.com/coatings
E-MAIL vesta@evonik.com

Evonik Corporation
Recource Efficiency
299 Jefferson Road
Parsippany, NJ 07054-0677, USA
PHONE +1 973 929-8000
FAX +1 973 929-8460

www.evonik.com/crosslinkers
www.evonik.com/coatings
E-MAIL vesta@evonik.com

Evonik Speciality Chemicals Co., Ltd.
55, Chundong Road
Xinzhuang Industry Park
Shanghai, 201108, PR China
PHONE +86 21 6119-1000
FAX +86 21 6119-1168

www.evonik.cn/crosslinkers
www.evonik.com/coatings
E-MAIL vesta@evonik.com

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