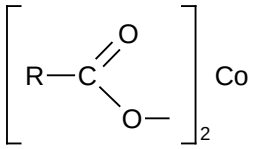
AkzoNobel
Tomorrow's Answers Today

Accelerator NL-51P

Product description

Cobalt(II) 2-ethylhexanoate, 6% Co, in solvent mixture



CAS No.	: 136-52-7
EINECS/ELINCS No.	: 205-250-6
TSCA status	: listed on inventory

Specifications

Appearance	: clear blue violet liquid
Cobalt content	: 5.9-6.1%

Characteristics

Density, 20°C	: 0.963 g/cm^3
Viscosity, 20°C	: 16 mPa.s

Storage

Accelerator NL-51P is stable at ambient temperatures.

When stored under these recommended storage conditions, Accelerator NL-51P will remain within the AkzoNobel specifications for a period of at least 9 months after delivery.

Major decomposition products

In a fire, cobalt oxides and carbon monoxide may be formed.

Packaging and transport

The standard packaging is a 25 kg and 200 kg drum.

Both packaging and transport meet the international regulations. For the availability of other packed quantities contact your AkzoNobel representative.

Accelerator NL-51P is classified as Environmentally hazardous substance, liquid, n.o.s.; UN 3082, PG III.

Safety and handling

Keep containers tightly closed. Store and handle Accelerator NL-51P in a dry well-ventilated area at ambient temperatures. Do not mix with organic peroxides.

Please refer to the Material Safety Data Sheet (MSDS) for further information on the safe storage, use and handling of Accelerator NL-51P. This information should be thoroughly reviewed prior to acceptance of this product.
The MSDS is available at www.akzonobel.com/polymer.

Applications

The curing of unsaturated polyester resins at ambient temperatures can in general not be performed by an organic peroxide alone. The radical formation, which is necessary to start the polymerization reaction, is at ambient temperatures with most generally applied organic peroxides too slow. To speed up the radical formation in a controllable way organic peroxides must therefore be used in combination with a so-called accelerator.

For ketone peroxides like methyl ethyl ketone peroxides, cyclohexanone peroxides and acetylacetone peroxide a cobalt accelerator must be used.

For this purpose the following formulations of cobalt 2-ethylhexanoate also called cobalt octoate are available:

Accelerator NL-49P	1% cobalt in aliphatic ester
Accelerator NL-51P	6% cobalt in aliphatic ester
Accelerator NL-53	10% cobalt in white spirit

The reactivity of the various cobalt accelerators is directly correlated with the cobalt content.
The use of a lower concentrated version increases the dosage accuracy. However, when the dosage level of e.g. Accelerator NL-49P must be higher than approx. 3% to achieve the required cure performance, it is advised to use a higher concentrated cobalt accelerator e.g. 0.5% Accelerator NL-51P.

The cure characteristics of an unsaturated polyester resin/ketone peroxide mixture can, apart from the choice of the ketone peroxide, very effectively be influenced by the dosage level of the cobalt accelerator. The dosage level of the cobalt accelerator expressed as Accelerator NL-53 (10% cobalt) can for this purpose be varied between e.g. 0.025% up to approximately 0.6% calculated on the UP resin.

When the right peroxide has been chosen and still the required gel time and cure characteristics can not be obtained with the cobalt accelerator alone, it is possible to increase the reactivity of the cobalt accelerator by the extra addition of a promoter like Accelerator NL-63-100 (N,N-Dimethylaniline) or Promotor D (N,N-Diethylacetoacetamide).

This adaptation of the accelerator system may be necessary when:
- a very short gel time and/or a very fast cure is required e.g. for resin transfer molding or the production of polymer concrete
- highly inhibited and/or low reactive resins must be cured e.g. bisphenol A/fumarate and vinylester resins.

The cure system ketone peroxide/cobalt accelerator can further be characterized by:
- the relatively low color, related to the cobalt dosage, of the cured molding
- a very good UV light resistance of the molded parts
- the long pot life of the cobalt accelerator in the polyester resin

A possible disadvantage may be that the cure system is more sensitive for moisture, pigments and fillers than the cure system dibenzoyl peroxide/ amine accelerator.

Cobalt accelerators can also be used to increase the reactivity of organic peresters, which are applied for the cure of unsaturated polyester resins at elevated temperatures. Moreover, the use of a cobalt accelerator gives in general a lower residual styrene content in the cured molding. For this application peresters like *Trigonox*® C, *Trigonox* 21, *Trigonox* 42 and the special mixture *Trigonox* 93 can be used.

Dosage

Depending on working conditions the following accelerator dosage level is recommended:

Accelerator NL-51P	0.040 - 1.0 phr *

Cure characteristics

In the following cure experiments the performance of cobalt 2-ethylhexanoate as accelerator will be demonstrated.

Gel times at 20°C

- in a standard orthophthalic resin with various ketone peroxides

	Accelerator NL-51P (phr)	
	0.08	0.17
2 phr Butanox® M-60	12	7
2 phr *Butanox* LPT	31	20
2 phr Cyclonox® LE-50	11	6
2 phr *Trigonox* 44B	14	8

- in various resins with Accelerator NL-63-100 as promoter

standard orthophthalic resin

2 phr *Butanox* M-60 + 0.17 phr Acc. NL-51P	7 min.
2 phr *Butanox* M-60 + 0.17 phr Acc. NL-51P + 0.05 phr Acc. NL-63-100	4 min.
2 phr *Butanox* M-60 + 0.17 phr Acc. NL-51P + 0.10 phr Acc. NL-63-100	2 min.
2 phr *Trigonox* 44B + 0.17 phr Acc. NL-51P	8 min.
2 phr *Trigonox* 44B + 0.17 phr Acc. NL-51P + 0.05 phr Acc. NL-63-100	5 min.
2 phr *Trigonox* 44B + 0.17 phr Acc. NL-51P + 0.10 phr Acc. NL-63-100	3 min.

bisphenol A/fumarate resin

2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P	145 min.
2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P + 0.05 phr Acc. NL-63-100	65 min.
2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P + 0.10 phr Acc. NL-63-100	34 min.

bisphenol A/vinylester resin

2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P	32 min.
2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P + 0.05 phr Acc. NL-63-100	22 min.
2 phr *Butanox* LPT + 0.5 phr Acc. NL-51P + 0.10 phr Acc. NL-63-100	16 min.

* phr = parts per hundred resin

Time-temperature curves at elevated temperatures (70°C and 90°C)

	Cure temp. °C	Gel time min.	Time to Peak min.	Peak exotherm °C
1 phr *Trigonox* 21	70	9	16	233
1 phr *Trigonox* 21 + 0.17 phr Acc. NL-51P	70	3	5	214
1 phr Trigonox 21	90	1	6	258
1 phr *Trigonox* 21 + 0.17 phr Acc. NL-51P	90	0.3	1.5	240
1 phr *Trigonox* C	90	9	25	236
1 phr *Trigonox* C + 0.17 phr Acc. NL-51P	90	2	6	258

Pot life at 20°C

The pot life has been determined of Accelerator NL-51P in a standard orthophthalic polyester resin at 20°C.

0.2 phr Accelerator NL-51P >6 months

AkzoNobel Functional Chemicals
Amersfoort, The Netherlands
T +31 33 467 6767
F +31 33 467 6151

E polymerchemicals.nl@akzonobel.com

AkzoNobel Functional Chemicals
Chicago, U.S.A.
T +1 312 544 7000
1 800 828 7929 (Toll free US only)
F +1 312 544 7188
E polymerchemicals.na@akzonobel.com

Akzo Nobel (Asia) Co., Ltd.
Shanghai, PR China
T +86 21 2216 3600
F +86 21 3360 7739

E polymerchemicals.ap@akzonobel.com

www.akzonobel.com/polymer