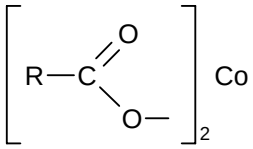
# Accelerator NL-49P

## Product description

Cobalt(II) 2-ethylhexanoate, 1% Co, in solvent mixture

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

## Specifications

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| Appearance | : clear blue violet liquid |
| Cobalt content | : 0.95-1.05% |

## Characteristics

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| Density, 20°C | : 0.949 g/cm$^3$ |
| Viscosity, 20°C | : 7 mPa.s |

## Storage

Accelerator NL-49P is stable at ambient temperatures.

When stored under these recommended storage conditions, Accelerator NL-49P will remain within the Akzo Nobel specifications for a period of at least six 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 Akzo Nobel representative.

Accelerator NL-49P is not classified as a dangerous good according to national and international transport regulations.

## Safety and handling

Keep containers tightly closed. Store and handle Accelerator NL-49P 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-49P. This information should be thoroughly reviewed prior to acceptance of this product.
The MSDS is available at www.akzonobel-polymerchemicals.com.

## 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:

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|---|---|
| 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-49P 0.25 - 3.0 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-49P (phr) | | |
|---|---|---|---|
| | 0.25 | 0.5 | 1 |
| 2 phr *Butanox*® M-60 | 22 | 12 | 7 |
| 2 phr *Butanox* LPT | 65 | 31 | 20 |
| 2 phr *Cyclonox*® LE-50 | 20 | 11 | 6 |
| 2 phr *Trigonox* 44B | 24 | 14 | 8 |

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

**standard orthophthalic resin**

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|---|---|
| 2 phr *Butanox* M-60 + 1 phr Acc. NL-49P | 7 min. |
| 2 phr *Butanox* M-60 + 1 phr Acc. NL-49P + 0.05 phr Acc. NL-63-100 | 4 min. |
| 2 phr *Butanox* M-60 + 1 phr Acc. NL-49P + 0.10 phr Acc. NL-63-100 | 2 min. |
| 2 phr *Trigonox* 44B + 1 phr Acc. NL-49P | 8 min. |
| 2 phr *Trigonox* 44B + 1 phr Acc. NL-49P + 0.05 phr Acc. NL-63-100 | 5 min. |
| 2 phr *Trigonox* 44B + 1 phr Acc. NL-49P + 0.10 phr Acc. NL-63-100 | 3 min. |

**bisphenol A/fumarate resin**

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|---|---|
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P | 145 min. |
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P + 0.05 phr Acc. NL-63-100 | 65 min. |
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P + 0.10 phr Acc. NL-63-100 | 34 min. |

**bisphenol A/vinylester resin**

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|---|---|
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P | 32 min. |
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P + 0.05 phr Acc. NL-63-100 | 22 min. |
| 2 phr *Butanox* LPT + 3 phr Acc. NL-49P + 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 + 1 phr Acc. NL-49P | 70 | 3 | 5 | 214 |
| 1 phr *Trigonox* 21 | 90 | 1 | 6 | 258 |
| 1 phr *Trigonox* 21 + 1 phr Acc. NL-49P | 90 | 0.3 | 1.5 | 240 |
| 1 phr *Trigonox* C | 90 | 9 | 25 | 236 |
| 1 phr *Trigonox* C + 1 phr Acc. NL-49P | 90 | 2 | 6 | 258 |

## Pot life at 20°C

The pot life has been determined of Accelerator NL-49P in a standard orthophthalic polyester resin at 20°C.

1 phr Accelerator NL-49P >6 months





Akzo Nobel Polymer Chemicals BV
Amersfoort, The Netherlands
Tel. +31 33 467 6767
Fax +31 33 467 6151
polymerchemicals.nl@akzonobel-pc.com

Akzo Nobel Polymer Chemicals LLC
Chicago, U.S.A.
Tel. +1 312 544 7000
1 800 828 7929 (Toll free US only)
Fax + 1 312 544 7188
polymerchemicals.na@akzonobel-pc.com

Akzo Nobel Polymer Chemicals Ltd.
Shanghai, PR China
Tel. +86 21 6279 3399
Fax +86 21 6247 1129
polymerchemicals.ap@akzonobel-pc.com

**www.akzonobel-polymerchemicals.com**