Buttons

Application data and cure data

Nouryon is the world’s leading producer of organic peroxides for the curing of thermoset resins and coatings. We’re home to the best known brands in the thermoset market, examples include Butanox®, Perkadox® and Trigonox®. We also have a whole range of auxiliary products, such as accelerators and promoters, to meet your specific production requirements.

This application guide introduces you to our thermoset product portfolio and helps you find a suitable curing system for your specific application.

Application
The buttons are manufactured either using a centrifugal casting sheet machine or by using a rod pouring machine.

The centrifugal casting process delivers sheets which are slowly cured and the buttons are cut out afterwards. The buttons which are cut out are still flexible and are fully cured in a hot water bath. The processing and polishing of the button is done once they are hard cured. The sheet buttons have a layered structure and usually have a white bottom layer and a clear top layer with only pearl filler inside.

The rods are casted in steel pipe segments and fully cured in the pipe in a water bath. Once hard cured they are taken out and sawn to buttons. These are again processed and polished to the final product. The rods casted buttons are usually larger and filled and fully colored and do not have the layered structure as the sheet buttons.

Nouryon curing agents
For the sheets process a gradual cure is optimal for processing and gives the best end result. In such case Butanox HBO-50 and Butanox M-50 can be used. In some button markets the end product needs to be phthalate free, in such cases we recommend using Butanox M-50A.

For the rods casting process Butanox M-50 is the recommended grade. For fast curing Cyclonox LE-50 can be used.

Reactivity figures
The reactivity data are measured in clear resins to mimic the temperature development in a sheet. The peroxides tested is Butanox M-50.
Cure of 1 mm pure UP resin layer at 20°C.
The speed of cure is expressed as the time to reach a Persoz hardness of respectively 30, 60 and 120 s.

<table>
<thead>
<tr>
<th>Persoz</th>
<th>30</th>
<th>60</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>2.4</td>
<td>4.1</td>
<td>13 h</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1.7</td>
<td>3.0</td>
<td>9.5 h</td>
</tr>
</tbody>
</table>
Cure data

Cyclonox LE-50

Cyclonox LE-50 is a general purpose cyclohexanone peroxide for the curing of unsaturated polyester resins in the presence of a cobalt accelerator at room and elevated temperatures.

The curing system Cyclonox LE-50 with cobalt as accelerator is particularly suitable for the curing of lacquers, spray putties and in hand lay-up and spray-up applications. Moreover, the manufacture of light resistant parts may be possible contrary to the curing system based on benzoyl peroxide and an amine accelerator.

Cyclonox LE-50 shows compared to Butanox M-50 a more gradual cure with a lower peak exotherm. For room temperature application it is necessary to use Cyclonox LE-50 together with a cobalt accelerator (e.g. Accelerator NL-49PN).

Dosing

Depending on working conditions, the following peroxide and accelerator dosage levels are recommended in UP resin formulations:

- **Cyclonox LE-50**
  - 1 - 4 phr

- **Accelerator NL-49PN**
  - 0.5 - 3 phr

*(parts per hundred resin)*

Cure characteristics

In a high reactive standard orthophthalic resin in combination with Accelerator NL-49PN (= 1% cobalt) the following application characteristics were determined:

**Gel times at 20°C**

<table>
<thead>
<tr>
<th>Formula</th>
<th>Gel time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Cyclonox LE-50 + 0.5 phr Accelerator NL-49PN</td>
<td>11 minutes</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>12 minutes</td>
</tr>
<tr>
<td>2 phr Cyclonox LE-50 + 1.0 phr Accelerator NL-49PN</td>
<td>6 minutes</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>7 minutes</td>
</tr>
</tbody>
</table>

**Cure of 1 mm pure resin layer at 20°C**

The speed of cure is expressed as the time to reach a Persoz hardness of respectively 30, 60 and 120 s.

<table>
<thead>
<tr>
<th>Persoz</th>
<th>30</th>
<th>60</th>
<th>120</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Cyclonox LE-50 + 0.5 phr Accelerator NL-49PN</td>
<td>2.5</td>
<td>5.5</td>
<td>22</td>
<td>h</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>2.4</td>
<td>4.1</td>
<td>13</td>
<td>h</td>
</tr>
<tr>
<td>2 phr Cyclonox LE-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1.6</td>
<td>4.0</td>
<td>18</td>
<td>h</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1.7</td>
<td>3.0</td>
<td>9.5</td>
<td>h</td>
</tr>
</tbody>
</table>
Cure of 4 mm laminates at 20°C

4 mm laminates have been made with a 450 g/m² glass chopped strand mat. The glass content in the laminates is 30% (w/w).

The following parameters were determined:

- Time-temperature curve.
- Speed of cure expressed as the time to achieve a Barcol hardness (934-1) of 0-5 and 25-30 respectively.
- Residual styrene content after 24 h at 20°C and a subsequent postcure of 8 h at 80°C.

<table>
<thead>
<tr>
<th>GEL TIME (min.)</th>
<th>TIME TO PEAK (min.)</th>
<th>PEAK EXOTHERM (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Cyclonox LE-50 + 0.5 phr Accelerator NL-49PN</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>13</td>
<td>36</td>
</tr>
<tr>
<td>2 phr Cyclonox LE-50 + 1.0 phr Accelerator NL-49PN</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>8</td>
<td>26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BARCOL</th>
<th>RESIDUAL STYRENE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5-25 (h)</td>
<td>25-30 (h)</td>
</tr>
<tr>
<td>2 phr Cyclonox LE-50 + 0.5 phr Accelerator NL-49PN</td>
<td>5</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>3</td>
</tr>
<tr>
<td>2 phr Cyclonox LE-50 + 1.0 phr Accelerator NL-49PN</td>
<td>&lt;1</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1</td>
</tr>
</tbody>
</table>

Pot life at 20°C

Pot lives were determined of a mixture of Cyclonox LE-50 and a non-preaccelerated UP resin at 20°C.

- 2 phr Cyclonox LE-50: 35 h
- 4 phr Cyclonox LE-50: 21 h
Butanox HBO-50

Butanox HBO-50 is a methyl ethyl ketone peroxide (MEKP) for the curing of unsaturated polyester resins in the presence of a cobalt accelerator at room and elevated temperatures.

The curing system Butanox HBO-50 and a cobalt accelerator is particularly suitable for the curing of laminating resins and lacquers when a faster gelation and initial cure speed is required than can be obtained with Butanox M-50. Moreover the manufacture of light resistant parts may be possible contrary to the curing benzoyl peroxide/amine accelerator.

For room temperature application it is necessary to use Butanox HBO-50 together with a cobalt accelerator (e.g. Accelerator NL-49PN).

Dosing
Depending on working conditions, the following peroxide and accelerator dosage levels are recommended:

<table>
<thead>
<tr>
<th>Butanox HBO-50</th>
<th>Accelerator NL-49PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4 phr</td>
<td>0.5 - 3 phr</td>
</tr>
</tbody>
</table>

Cure characteristics
In a high reactive standard orthophthalic resin in combination with Accelerator NL-49PN (= 1% cobalt) the following application characteristics were determined:

<table>
<thead>
<tr>
<th>Gel times at 20°C</th>
<th>Cure of 1 mm pure resin layer at 20°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox HBO-50 + 0.5 phr Accelerator NL-49PN</td>
<td>Persoz 30</td>
</tr>
<tr>
<td>2 phr Butanox HBO-50 + 1.0 phr Accelerator NL-49PN</td>
<td></td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td></td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td></td>
</tr>
</tbody>
</table>
Cure of 4 mm laminates at 20°C
4 mm laminates have been made with a 450 g/m² glass chopped strand mat. The glass content in the laminates is 30% (w/w).

The following parameters were determined:
- **Time-temperature curve.**
- Speed of cure expressed as the time to achieve a Barcol hardness (934-1) of 0-5 and 25-30 respectively.
- Residual styrene content after 24 h at 20°C and a subsequent postcure of 8 h at 80°C.

<table>
<thead>
<tr>
<th></th>
<th>GEL TIME (min.)</th>
<th>TIME TO PEAK (min.)</th>
<th>PEAK EXOTHERM (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox HBO-50 + 0.5 phr Accelerator NL-49PN</td>
<td>8</td>
<td>26</td>
<td>58</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>13</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>2 phr Butanox HBO-50 + 1.0 phr Accelerator NL-49PN</td>
<td>4</td>
<td>18</td>
<td>79</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>8</td>
<td>26</td>
<td>64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>BARCOL</th>
<th>RESIDUAL STYRENE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-5 (h)</td>
<td>25-30 (h)</td>
</tr>
<tr>
<td>2 phr Butanox HBO-50 + 0.5 phr Accelerator NL-49PN</td>
<td>&lt;1</td>
<td>12</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>2 phr Butanox HBO-50 + 0.5 phr Accelerator NL-49PN</td>
<td>&lt;1</td>
<td>4.7</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

**Pot life at 20°C**
Pot lives were determined of a mixture of Butanox HBO-50 and a non-preaccelerated UP resin at 20°C.

- 2 phr Butanox HBO-50: 18 h
- 4 phr Butanox HBO-50: 10 h
Butanox M-50

Butanox M-50 is a general purpose methyl ethyl ketone peroxide (MEKP) for the curing of unsaturated polyester resins in the presence of a cobalt accelerator at room and elevated temperatures.

The curing system Butanox M-50/cobalt accelerator is particularly suitable for the curing of gelcoat resins, laminating resins, lacquers and castings, moreover, the manufacture of light resistant parts may be possible contrary to the curing system benzoyl peroxide/amine accelerator.

Practical experience throughout many years has proven that by the guaranteed low water content and the absence of polar compounds in Butanox M-50, this peroxide is very suitable in GRP products in particular for gelcoat and marine applications.

For room temperature application it is necessary to use Butanox M-50 together with a cobalt accelerator (e.g. Accelerator NL-49PN).

Dosing

Depending on working conditions, the following peroxide and accelerator dosage levels are recommended:

<table>
<thead>
<tr>
<th>Butanox M-50</th>
<th>Accelerator NL-49PN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 4 phr</td>
<td>0.5 - 3 phr</td>
</tr>
</tbody>
</table>

* (parts per hundred resin)

Cure characteristics

In a high reactive standard orthophthalic resin in combination with Accelerator NL-49PN (= 1% cobalt) the following application characteristics were determined:

**Gel times at 20°C**

<table>
<thead>
<tr>
<th>Peroxide</th>
<th>Accelerator</th>
<th>Time (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

**Cure of 1 mm pure resin layer at 20°C**

The speed of cure is expressed as the time to reach a Persoz hardness of respectively 30, 60 and 120 s.

<table>
<thead>
<tr>
<th>Persoz</th>
<th>30</th>
<th>60</th>
<th>120</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>2.4</td>
<td>4.1</td>
<td>13</td>
<td>h</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>17</td>
<td>3.0</td>
<td>9.5</td>
<td>h</td>
</tr>
</tbody>
</table>
Cure of 4 mm laminates at 20°C
4 mm laminates have been made with a 450 g/m² glass chopped strand mat. The glass content in the laminates is 30% (w/w).

The following parameters were determined:
- Time-temperature curve.
- Speed of cure expressed as the time to achieve a Barcol hardness (934-1) of 0-5 and 25-30 respectively.
- Residual styrene content after 24 h at 20°C and a subsequent postcure of 8 h at 80°C.

<table>
<thead>
<tr>
<th></th>
<th>GEL TIME (min.)</th>
<th>TIME TO PEAK (min.)</th>
<th>PEAK EXOTHERM (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>13</td>
<td>36</td>
<td>44</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>8</td>
<td>26</td>
<td>64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>BARCOL</th>
<th>RESIDUAL STYRENE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-5 (h)</td>
<td>25-30 (h)</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 0.5 phr Accelerator NL-49PN</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>2 phr Butanox M-50 + 1.0 phr Accelerator NL-49PN</td>
<td>1</td>
<td>5</td>
</tr>
</tbody>
</table>

Pot life at 20°C
Pot lives were determined of a mixture of Butanox M-50 and a non-preaccelerated UP resin at 20°C.

2 phr Butanox M-50 12 h
4 phr Butanox M-50 7 h

Solubility
Butanox M-50 is miscible with phthalates and slightly miscible with water.

Colors
Butanox M-50 is available in the colors blue, yellow, red-YM 1/6 and Vanishing Red (VR).
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-49PN: 1% cobalt in aliphatic ester
- Accelerator NL-51PN: 6% cobalt in aliphatic ester
- Accelerator NL-53N: 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-49PN 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-51PN.

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-53N (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 cannot 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 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 vinyl ester 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 21S, Trigonox 42S and the special mixture Trigonox 93 can be used.
Dosage
Depending on working conditions the following accelerator dosage level is recommended:

** Accelerator NL-49PN
0.25 - 3.0 phr *

*(parts per hundred resin)*

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

<table>
<thead>
<tr>
<th>ACCELERATOR NL-49PN (PHR)</th>
<th>0.25</th>
<th>0.5</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 phr Butanox M 60</td>
<td>22</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>2 phr Butanox LPT-IN</td>
<td>65</td>
<td>31</td>
<td>20</td>
</tr>
<tr>
<td>2 phr Cyclonox LE 50</td>
<td>20</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td>2 phr Trigonox 44B</td>
<td>24</td>
<td>14</td>
<td>8</td>
</tr>
</tbody>
</table>

in various resins with Dimethylaniline, 100% as promoter

**standard orthophthalic resin**
2 phr Butanox M 60 + 1 phr Accelerator NL-49PN 7 min.
2 phr Butanox M 60 + 1 phr Accelerator NL-49PN + 0.05 phr Dimethylaniline, 100% 4 min.
2 phr Butanox M 60 + 1 phr Accelerator NL-49PN + 0.10 phr Dimethylaniline, 100% 2 min.

2 phr Trigonox 44B + 1 phr Accelerator NL-49PN 8 min.
2 phr Trigonox 44B + 1 phr Accelerator NL-49PN + 0.05 phr Dimethylaniline, 100% 5 min.
2 phr Trigonox 44B + 1 phr Accelerator NL-49PN + 0.10 phr Dimethylaniline, 100% 3 min.

**bisphenol A/fumarate resin**
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN 145 min.
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN + 0.05 phr Dimethylaniline, 100% 65 min.
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN + 0.10 phr Dimethylaniline, 100% 34 min.

**bisphenol A/vinylester resin**
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN 32 min.
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN + 0.05 phr Dimethylaniline, 100% 22 min.
2 phr Butanox LPT-IN + 3 phr Accelerator NL-49PN + 0.10 phr Dimethylaniline, 100% 16 min.

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

<table>
<thead>
<tr>
<th>ACCELERATOR NL-49PN</th>
<th>CURE TEMP (°C)</th>
<th>GEL TIME (min.)</th>
<th>TIME TO PEAK (min.)</th>
<th>PEAK EXOTHERM (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 phr Trigonox 21S</td>
<td>70</td>
<td>916</td>
<td>233</td>
<td></td>
</tr>
<tr>
<td>1 phr Trigonox 21S + 1 phr Accelerator NL-49PN</td>
<td>70</td>
<td>35</td>
<td>214</td>
<td></td>
</tr>
<tr>
<td>1 phr Trigonox 21S</td>
<td>90</td>
<td>16</td>
<td>258</td>
<td></td>
</tr>
<tr>
<td>1 phr Trigonox 21S + 1 phr Accelerator NL-49PN</td>
<td>90</td>
<td>0.3</td>
<td>1.5</td>
<td>240</td>
</tr>
<tr>
<td>1 phr Trigonox C</td>
<td>90</td>
<td>925</td>
<td>236</td>
<td></td>
</tr>
<tr>
<td>1 phr Trigonox C + 1 phr Accelerator NL-49PN</td>
<td>9</td>
<td>26</td>
<td>258</td>
<td></td>
</tr>
</tbody>
</table>

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

1 phr Accelerator NL-49PN 6 months
For product inquiry and ordering information, please contact your Nouryon account manager or regional Nouryon sales office.

**Contact us**

**America**
- US and other countries
  - Citadel Center
  - 131 S Dearborn St, Suite 1000
  - Chicago IL 60603-5566
  - USA
  - T +1 800 828 7929 (US only)
  - E polymerchemistry-na@nouryon.com
- Mexico
  - Av. Morelos No. 49
  - Col. Tecamachalco
  - Los Reyes La Paz Estado de Mexico
  - C.P. 56500 Mexico
  - T +52 55 5858 0700
  - E polymerchemistry.mx@nouryon.com
- Brazil
  - Rodavia Nouryon no. 707
  - Portão A – Planta C
  - Bairro São Roque da Chave
  - 13295-000 Itupeva - São Paulo
  - Brazil
  - T +55 11 4591 8800
  - E polymerchemistry.sa@nouryon.com

**Europe, India, Middle East and Africa**
- France, Italy, Spain and Portugal
  - Autovia de Castelldefels, km 4.65
  - 08820 El Prat de Llobregat
  - Barcelona
  - Spain
  - T +34 933 741991
  - E polymerchemistry.es@nouryon.com
- India
  - North Block 801, Empire Tower,
  - Reliable Cloud City Campus,
  - Off Thane – Belapur Road
  - Airoli, Navi Mumbai - 400708
  - India
  - T +91(0) 22 68426700
  - E polymerchemistry.mx@nouryon.com
- Middle East
  - Silicon park, Building A6
  - Office no 402, 4th floor
  - Dubai Silicon Oasis
  - Dubai
  - United Arab Emirates
  - T +971 4 2471500
  - E communications.me@nouryon.com
- Russia and CIS
  - Smolnaya Str., 24D,
  - Commercial Tower Meridian
  - 125445 Moscow
  - Russia
  - T +7 495 766 16 06
  - E info.moscow@nouryon.com
- Other countries
  - Zoephenseweg 10
  - 7418 AJ Deventer
  - The Netherlands
  - E polymerchemistry.nl@nouryon.com
- Asia Pacific
  - 22F, Eco City, 1788 West Nan Jing Road
  - Shanghai 200040
  - P.R. China
  - T +86 21 2220 5000
  - E polymerchemistry.ap@nouryon.com

**Additional information**
Product Data Sheets (PDS) and Safety Data Sheets (SDS) for our polymerization initiators are available at polymerchemistry.nouryon.com

All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable. Nouryon, however, makes no warranty as to accuracy and/or sufficiency of such information and/or suggestions, as to the product’s merchantability or fitness for any particular purpose, or that any suggested use will not infringe any patent. Nouryon does not accept any liability whatsoever arising out of the use of or reliance on this information, or out of the use or the performance of the product. Nothing contained herein shall be construed as granting or extending any license under any patent. Customer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes. The information contained herein supersedes all previously issued information on the subject matter covered. The customer may forward, distribute, and/or photocopy this document only if unaltered and complete, including all of its headers and footers, and should refrain from any unauthorized use. Don’t copy this document to a website.

Butanox, Laurox, Nouryact, Nourytainer, Perkadox and Trigonox are registered trademarks of Nouryon Chemicals B.V. or affiliates in one or more territories.

© December 2019
We are a global specialty chemicals leader. Industries worldwide rely on our essential chemistry in the manufacture of everyday products such as paper, plastics, building materials, food, pharmaceuticals, and personal care items. Building on our nearly 400-year history, the dedication of our 10,000 employees, and our shared commitment to business growth, strong financial performance, safety, sustainability, and innovation, we have established a world-class business and built strong partnerships with our customers. We operate in over 80 countries around the world and our portfolio of industry-leading brands includes Eka, Dissolvine, Trigonox, and Berol.