Chemical anchors and mine bolts

Application data and cure data

Nouryon is the world’s leading producer of organic peroxides for the curing of thermoset resins, coatings and specialty monomers. 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
To fix screws and bolts in rocks, mine walls, bridges by using a body filler

Nouryon curing agents
• Perkadox GB-50X
• Perkadox CH-50X
• Perkadox 33
• Perkadox 20S

Main products
Sausage mine bolts
• thermoplastic tube filled with UP resin and filler containing 25 - 30% resin
• inside the sausage there is a compartment containing the BPO (benzoyl peroxide) formulation
• UP resin is pre-accelerated with a tertiary amine and inhibitor having a shelf life of approx. 1 year at 30°C and a cure of 30 sec. to 30 min. at ambient temperatures

Glass tubes
• Large glass tube filled with UP resin and sand containing 25 - 35% resin
• inside this large glass tube there is a small glass tube filled with Perkadox CH-50X / Perkadox GB-50X, or Perkadox 33 or Perkadox 20S

Reason for our products
• High quality
• Good aftersales and technical service
• Safety research
• Worldwide distribution
• Customized application research: special formulated products for an optimal performance in this application
Reactivity figures
Perkadox CH-50X / Perkadox GB-50X
Cure characteristics at 20°C of 3 phr Perkadox CH-50X / Perkadox GB-50X + various amines

Gel time in 100 grams pure UP resin.
Time to peak exotherm and peak exotherm measured in 4 mm laminates.

DMA = Dimethylaniline-100%
DEA = Accelerator NL-64-100
DMPT = Accelerator NL-65-100

0.25 % DMPT  151°C
0.10 % DMPT  131°C
0.05 % DMPT  154°C
0.75 % DEA   140°C
0.50 % DEA   143°C
0.25 % DMA   99°C
0.10 % DMA   64°C

°C = peak exotherm
Gel time in pure UP resin
Time to peak in laminate
Chemical anchors and mine bolts

Cure data

Perkadox CH-50X

Perkadox CH-50X is a non-caking, fine, granular powder with excellent free flowing properties containing 50% dibenzoylperoxide. Perkadox GB-50X has the same characteristics but is phthalate free.

Perkadox CH-50X is used for the curing of unsaturated polyester resins and (meth)acrylic resins at ambient and elevated temperatures. At temperatures up to 80°C, Perkadox CH-50X should be used in combination with an aromatic tertiary amine accelerator, above 80°C the use of an accelerator is not required.

Perkadox CH-50X is easy to handle, easy to disperse and dissolves very quickly in unsaturated polyester resins and (meth)acrylic resins.

The curing system Perkadox CH-50X /amine accelerator shows a very fast cure that is hardly influenced by humidity and fillers. Even at low temperatures a relatively good cure will be obtained. A disadvantage may be the yellow color and poor light resistance of the molded product.

For ambient temperature curing the following amine accelerators are available to adjust the gel time and speed of cure of the cure system based on Perkadox CH-50X:

- Accelerator NL-65-100 (N,N-Dimethyl p toluidine) for short gel times
- Accelerator NL-67 (Ethoxylated-p-toluidine) for medium gel times
- Accelerator NL-64-100 (N,N-Diethyl aniline) for long gel times

Dosing

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

**Perkadox CH-50X**

<table>
<thead>
<tr>
<th>Parts per hundred resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 - 5 phr</td>
</tr>
</tbody>
</table>

**Amine accelerator**

<table>
<thead>
<tr>
<th>Parts per hundred resin</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05 - 0.5 phr</td>
</tr>
</tbody>
</table>

Cure characteristics

In a high reactive standard orthophthalic polyester resin the following application characteristics were determined.

<table>
<thead>
<tr>
<th>UP resin</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perkadox CH-50X</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>N,N-Dimethylaniline</td>
<td>0.1</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerator NL-64-100</td>
<td>0.1</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerator NL-65-100</td>
<td>0.05</td>
<td>0.1</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Gel time (minutes) | 22 | 6  | 160 | 20 | 20 | 5  | 1  |

Chemical anchors and mine bolts

Nouryon
Chemical anchors and mine bolts

### 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>
</tr>
</thead>
<tbody>
<tr>
<td>3 phr Perkadox CH-50X + 0.1 phr N,N-Dimethylaniline</td>
<td>0.5</td>
<td>0.8</td>
<td>2</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.4 phr N,N-Dimethylaniline</td>
<td>&lt;0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.5 phr Accelerator NL-64-100</td>
<td>0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.05 phr Accelerator NL-65-100</td>
<td>1</td>
<td>2.5</td>
<td>14</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.1 phr Accelerator NL-65-100</td>
<td></td>
<td></td>
<td>0.5</td>
</tr>
</tbody>
</table>

### Cure of 4 mm laminates at 20°C
4 mm laminates have been made with 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>3 phr Perkadox CH-50X + 0.1 phr N,N-Dimethylaniline</td>
<td>24</td>
<td>31</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.5 phr Accelerator NL-64-100</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.05 phr Accelerator NL-65-100</td>
<td>28</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BARCOL</th>
<th>RESIDUAL STYRENE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5 (h)</td>
<td>25-30 (h)</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.1 phr N,N-Dimethylaniline</td>
<td>&lt;1</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.5 phr Accelerator NL-64-100</td>
<td>&lt;&lt;1</td>
</tr>
<tr>
<td>3 phr Perkadox CH-50X + 0.05 phr Accelerator NL-65-100</td>
<td>1</td>
</tr>
</tbody>
</table>

### Pot life at 20°C
Pot lives were determined of a mixture of Perkadox CH-50X and a non-preaccelerated resin at 20°C.

- 3 phr Perkadox CH-50X: 21 days
- 6 phr Perkadox CH-50X: 11 days
Perkadox GB-50
(also applicable for Perkadox GB-50L and Perkadox GB-50X)

Perkadox GB-50 is a free flowing, fine, granular powder containing 50% dibenzoyl peroxide for the curing of unsaturated polyester and acrylic resins at ambient and elevated temperatures. At temperatures up to 80°C, Perkadox GB-50 should be used in combination with an aromatic tertiary amine accelerator. Above 80°C the use of an accelerator is not required.

Perkadox GB-50 is easy to handle, easy to disperse and dissolves very quickly in unsaturated polyester resins and acrylic resins. When in acrylic resins a very high degree of transparency of the cured part is required the special grade Perkadox GB-50L is advised. The curing system Perkadox GB-50/amine accelerator shows a very fast cure that is hardly influenced by humidity and fillers. Even at low temperatures a relatively good cure will be obtained. A disadvantage may be the yellow colour and poor light resistance of the molded product.

For curing at ambient temperature the following amine accelerators are available to adjust the gel time and speed of cure of the cure system based on Perkadox GB-50:

- Accelerator NL-65-100 (N,N-Dimethyl p toluidine) for short gel times
- Accelerator NL-67 (Ethoxylated-p-toluidine) for medium gel times
- Accelerator NL-64-100 (N,N-Diethyl aniline) for long gel times

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

<table>
<thead>
<tr>
<th>Perkadox GB-50</th>
<th>2 - 5 phr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amine accelerator</td>
<td>0.05 - 0.5 phr</td>
</tr>
</tbody>
</table>

* (parts per hundred resin)

Cure characteristics
In a high reactive standard orthophthalic polyester resin the following application characteristics were determined.

<table>
<thead>
<tr>
<th>GELTIME CLEAR RESIN AT 20°C (GELNORM)</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP resin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perkadox GB-50</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Accelerator NL-64-100</td>
<td>0.1</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accelerator NL-65-100</td>
<td></td>
<td></td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gel time (minutes)</td>
<td>160</td>
<td>20</td>
<td>20</td>
<td>5</td>
<td>1</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>3 phr Perkadox GB-50 + 0.1 phr Accelerator NL-64-100</td>
<td>0.5</td>
<td>1</td>
<td>h</td>
<td></td>
</tr>
<tr>
<td>3 phr Perkadox GB-50 + 0.05 phr Accelerator NL-65-100</td>
<td>1</td>
<td>2.5</td>
<td>14</td>
<td>h</td>
</tr>
<tr>
<td>3 phr Perkadox GB-50 + 0.1 phr Accelerator NL-65-100</td>
<td></td>
<td>0.5</td>
<td>h</td>
<td></td>
</tr>
</tbody>
</table>
Cure of 4 mm laminates at 20°C
4 mm laminates have been made with 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 24h at 20°C and a subsequent postcure of 8h 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>3 phr Perkadox GB-50 + 0.5 phr Accelerator NL-64-100</td>
<td>21</td>
<td>26</td>
</tr>
<tr>
<td>3 phr Perkadox GB-50 + 0.05 phr Accelerator NL-65-100</td>
<td>28</td>
<td>35</td>
</tr>
</tbody>
</table>

Barcol | Residual styrene
---|---
0-5 (h) | 25-30 (h) | 24 h, 20°C (%) | +8 h, 80% (%) |
3 phr Perkadox GB-50 + 0.5 phr Accelerator NL-64-100 | <1 | 2.9 | 2.1 |
3 phr Perkadox GB-50 + 0.05 phr Accelerator NL-65-100 | 1 | 8.5 | 6.6 | 0.8 |

In a high reactive Bisphenol-A epoxy vinyl ester resin the following application characteristics were determined.

**Gel time clear resin at 20°C (Gelnorm)**
3 phr Perkadox GB-50 + 0.15 phr Accelerator NL-67 | 11 minutes

**Clear SPI reactivity data with different types of accelerators**

<table>
<thead>
<tr>
<th>GEL TIME (min.)</th>
<th>TIME TO PEAK (min.)</th>
<th>PEAK EXOTHERM (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 phr Perkadox GB-50 + 0.15 phr Accelerator NL-67</td>
<td>29</td>
<td>39</td>
</tr>
<tr>
<td>3 phr Perkadox GB-50 + 0.2 phr Accelerator NL-65</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>3 phr Perkadox GB-50 + 0.2 phr Accelerator NL-67</td>
<td>8</td>
<td>15</td>
</tr>
</tbody>
</table>

Cure of 4 mm laminates at 20°C in MMA resin
4 mm laminates have been made with 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 (SPI method)
- Speed of cure expressed as the time to achieve a Barcol hardness (934-1) of 25.
- Residual styrene content after 24h at 20°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>3 phr Perkadox GB-50 + 0.15 phr Accelerator NL-67</td>
<td>10</td>
<td>17</td>
</tr>
</tbody>
</table>

Barcol | Residual styrene
---|---
25 (h) | 24 h, 20°C (%) |
3 phr Perkadox GB-50 + 0.15 phr Accelerator NL-67 | 1 | 17 |
Perkadox 33

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 33 was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 33 can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 33 is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 33 cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

\[ \begin{align*}
\text{Component a} & \\
& \begin{align*}
& 5-10\% \text{ Perkadox 33, calculated on the resin} \\
& \text{Filler, as much as desired} \\
& \text{Pigment}
\end{align*} \\
\text{Component b} & \\
& \begin{align*}
& \text{Resin} \\
& 0.05-0.15\% \text{ N,N-Dimethylaniline}
\end{align*}
\end{align*} \]

When the putty has to be applied component a) and b) are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 33 and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty. A good formulation proved to be:

FILLER | INFLUENCE ON STABILITY
--- | ---
caborundum | no influence
gypsum | no influence
mica | no influence
wood flour | no influence
chalk | no influence
quartz flour | no influence
pumice powder | no influence
talc, pure | no influence
aluminum powder | weak influence

Perkadox 33

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 33 was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 33 can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 33 is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 33 cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

\[ \begin{align*}
\text{Component a} & \\
& \begin{align*}
& 5-10\% \text{ Perkadox 33, calculated on the resin} \\
& \text{Filler, as much as desired} \\
& \text{Pigment}
\end{align*} \\
\text{Component b} & \\
& \begin{align*}
& \text{Resin} \\
& 0.05-0.15\% \text{ N,N-Dimethylaniline}
\end{align*}
\end{align*} \]

When the putty has to be applied component a) and b) are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 33 and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty. A good formulation proved to be:

FILLER | INFLUENCE ON STABILITY
--- | ---
caborundum | no influence
gypsum | no influence
mica | no influence
wood flour | no influence
chalk | no influence
quartz flour | no influence
pumice powder | no influence
talc, pure | no influence
aluminum powder | weak influence

Perkadox 33

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 33 was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 33 can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 33 is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 33 cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

\[ \begin{align*}
\text{Component a} & \\
& \begin{align*}
& 5-10\% \text{ Perkadox 33, calculated on the resin} \\
& \text{Filler, as much as desired} \\
& \text{Pigment}
\end{align*} \\
\text{Component b} & \\
& \begin{align*}
& \text{Resin} \\
& 0.05-0.15\% \text{ N,N-Dimethylaniline}
\end{align*}
\end{align*} \]

When the putty has to be applied component a) and b) are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 33 and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty. A good formulation proved to be:

FILLER | INFLUENCE ON STABILITY
--- | ---
caborundum | no influence
gypsum | no influence
mica | no influence
wood flour | no influence
chalk | no influence
quartz flour | no influence
pumice powder | no influence
talc, pure | no influence
aluminum powder | weak influence

Perkadox 33

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 33 was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 33 can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 33 is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 33 cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

\[ \begin{align*}
\text{Component a} & \\
& \begin{align*}
& 5-10\% \text{ Perkadox 33, calculated on the resin} \\
& \text{Filler, as much as desired} \\
& \text{Pigment}
\end{align*} \\
\text{Component b} & \\
& \begin{align*}
& \text{Resin} \\
& 0.05-0.15\% \text{ N,N-Dimethylaniline}
\end{align*}
\end{align*} \]

When the putty has to be applied component a) and b) are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 33 and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty. A good formulation proved to be:

FILLER | INFLUENCE ON STABILITY
--- | ---
caborundum | no influence
gypsum | no influence
mica | no influence
wood flour | no influence
chalk | no influence
quartz flour | no influence
pumice powder | no influence
talc, pure | no influence
aluminum powder | weak influence

Perkadox 33

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 33 was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 33 can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 33 is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 33 cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

\[ \begin{align*}
\text{Component a} & \\
& \begin{align*}
& 5-10\% \text{ Perkadox 33, calculated on the resin} \\
& \text{Filler, as much as desired} \\
& \text{Pigment}
\end{align*} \\
\text{Component b} & \\
& \begin{align*}
& \text{Resin} \\
& 0.05-0.15\% \text{ N,N-Dimethylaniline}
\end{align*}
\end{align*} \]

When the putty has to be applied component a) and b) are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 33 and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty. A good formulation proved to be:

FILLER | INFLUENCE ON STABILITY
--- | ---
caborundum | no influence
gypsum | no influence
mica | no influence
wood flour | no influence
chalk | no influence
quartz flour | no influence
pumice powder | no influence
talc, pure | no influence
aluminum powder | weak influence
<table>
<thead>
<tr>
<th>Material</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>asbestine, pure</td>
<td>weak influence</td>
</tr>
<tr>
<td>infusorial earth, kieselguhr (pure)</td>
<td>weak influence</td>
</tr>
<tr>
<td>lithopone</td>
<td>weak influence</td>
</tr>
<tr>
<td>microdol</td>
<td>weak influence</td>
</tr>
<tr>
<td>iron oxide, red</td>
<td>weak influence</td>
</tr>
<tr>
<td>iron powder</td>
<td>weak influence</td>
</tr>
<tr>
<td>slate powder</td>
<td>weak to moderate influence</td>
</tr>
<tr>
<td>titanium dioxide (rutile)</td>
<td>weak to moderate influence</td>
</tr>
<tr>
<td>graphite</td>
<td>strong influence</td>
</tr>
<tr>
<td>china clay</td>
<td>strong influence</td>
</tr>
<tr>
<td>bentone 34</td>
<td>very strong influence</td>
</tr>
<tr>
<td>carbon black</td>
<td>very strong influence</td>
</tr>
</tbody>
</table>

It is clear that the latter two substances are not suitable for this purpose. We would like to point out that these details only refer to the products which we have investigated. Similar products from other sources may behave differently, so that we recommend carrying out some tests in individual cases.

When the filler is added just before use the influence of the filler on the cure speed of the putty is slight, as the inhibiting effect appears only after a certain time of storage. China clay, however, gives an immediate inhibition. Most pigments more or less accelerate the cure.

When applying these putties the following rules should be observed:

- The base must be completely dry.
- The base must be well cleaned and free of grease.
- When using Perkadox 33 the temperature during application must be higher than 15°C.
- Storage of the putty components must be at a cool dark place (see data sheet).
Perkadox 20S

For some special applications it is desirable to use a dry benzoyl peroxide powder as a catalyst. For these cases the benzoyl peroxide formulation Perkadox 20S was introduced, which is a mixture of benzoyl peroxide and filler. Perkadox 20S can be handled very easily and without risk. It contains no plasticizer and is lower concentrated than the usual benzoyl peroxide formulations, which makes dosing easier.

One of the most important applications for Perkadox 20S is as a catalyst for putties based on unsaturated polyester resins. A putty containing an accelerated polyester resin and Perkadox 20S cures rapidly so that after a short time the surface can be sanded and polished.

The putty is made of two components, viz.:

a) a powder consisting of a mixture of filler with pigment and Perkadox 20S as a catalyst.
b) a liquid component consisting of polyester resin and N,N-Dimethylaniline or NL-65-100, or alternatively, a polyester resin with a built-in amine accelerator.

When the putty has to be applied component a and b are mixed.

The manufacturer of these putties should take care that the powder contains Perkadox 20S and the liquid component the Accelerator, in such amounts that after mixing the two components there is enough time to apply the putty.

A good formulation has proved to be:

**Component a**
- 8-17% Perkadox 20S, calculated on the resin
- filler, as much as wanted
- pigment

**Component b**
- resin
- 0.05-0.15% N,N-Dimethylaniline

In component a) the last two components not only have a considerable influence on the properties of the putty, but also on the stability of the catalyst and the cure speed.

Some fillers and pigments cause a decomposition of the benzoyl peroxide so that no cure is obtained.

Experiments of Perkadox 20S together with fillers gave the following results:

<table>
<thead>
<tr>
<th>FILLER</th>
<th>INFLUENCE ON STABILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>caborundum</td>
<td>no influence</td>
</tr>
<tr>
<td>gypsum</td>
<td>no influence</td>
</tr>
<tr>
<td>mica</td>
<td>no influence</td>
</tr>
<tr>
<td>wood flour</td>
<td>no influence</td>
</tr>
<tr>
<td>chalk</td>
<td>no influence</td>
</tr>
<tr>
<td>quartz flour</td>
<td>no influence</td>
</tr>
<tr>
<td>pumice powder</td>
<td>no influence</td>
</tr>
<tr>
<td>talc, pure</td>
<td>no influence</td>
</tr>
<tr>
<td>aluminium powder</td>
<td>weak influence</td>
</tr>
</tbody>
</table>
Chemical anchors and mine bolts

<table>
<thead>
<tr>
<th>Substance</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>asbestine, pure</td>
<td>weak influence</td>
</tr>
<tr>
<td>infusorial earth, kieselguhr (pure)</td>
<td>weak influence</td>
</tr>
<tr>
<td>lithopone</td>
<td>weak influence</td>
</tr>
<tr>
<td>microdol</td>
<td>weak influence</td>
</tr>
<tr>
<td>iron oxide, red</td>
<td>weak influence</td>
</tr>
<tr>
<td>iron powder</td>
<td>weak influence</td>
</tr>
<tr>
<td>slate powder</td>
<td>weak to moderate influence</td>
</tr>
<tr>
<td>titanium dioxide (rutile)</td>
<td>weak to moderate influence</td>
</tr>
<tr>
<td>graphite</td>
<td>strong influence</td>
</tr>
<tr>
<td>china clay</td>
<td>strong influence</td>
</tr>
<tr>
<td>bentone 34</td>
<td>very strong influence</td>
</tr>
<tr>
<td>carbon black</td>
<td>very strong influence</td>
</tr>
</tbody>
</table>

It is clear that the latter two substances are not suitable for this purpose. We should like to point out that these details only refer to the products, which we have investigated. Similar products from other sources may behave differently, so that we recommend carrying out some tests in individual cases.

When the filler is added just before use the influence of the filler on the cure speed of the putty is slight, as the inhibiting effect appears only after a certain time of storage. China clay, however, gives an immediate inhibition. Most pigments more or less accelerate the cure.

When applying these putties the following rules should be observed:

• the base must be completely dry.
• the base must be well cleaned and free of grease.
• when using Perkadox 20S the temperature during application must be higher than 15°C.
• storage of the putty components must be at a cool dark place (see data sheet).
Contact us

For product inquiry and ordering information, please contact your Nouryon account manager or regional Nouryon sales office.

Americas

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 polymer.amer@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 polymer.mx@nouryon.com

Brazil
Rodavía Nouryon no. 707
Portão A – Planta C
Bairro São Roque da Chave
13295-000 Itupeva - São Paulo
Brazil
T +55 11 4591 8800
E polymer.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 polymer.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 polymer.mernea@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

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

Other countries
Zutphenseweg 10
7418 AJ Deventer
The Netherlands
E polymer.mernea@nouryon.com

Asia Pacific
Room 2501 & 26F, Building A
Caohejing Center
No. 1520 Gumei Road, Xuhui District
Shanghai 200233
P.R. China
T +86 21 2289 1000
E polymer.apac@nouryon.com

Additional information
Product Data Sheets (PDS) and Safety Data Sheets (SDS) for our polymerization initiators are available at www.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 Functional Chemicals B.V. or affiliates in one or more territories.

© January 2021
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, Trigox, and Berol.

nouryon.com