Initiator BK has been developed for the initiation of radical polymerisation reactions. The product can also be used as a reactive retarding agent for peroxides. Initiator BK is free of peroxides and azo compounds. The product decomposes endothermally and is not self-accelerating. Initiator BK is therefore not subject to any specially strict storage and transport regulations. Initiator BK can be used whenever radical polymerisation reactions need to be started at temperatures between 90 °C and 160 °C.

Chemical Composition

<table>
<thead>
<tr>
<th>Chemical composition</th>
<th>formulation of an oligomeric benzopinacol silylether compound dissolved in approx. 30 % triethyl phosphate and approx. 5 % toluene</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS Reg. No.</td>
<td>78-40-0, 108-88-3</td>
</tr>
<tr>
<td>Physical form</td>
<td>supersaturated, yellow, opaque solution</td>
</tr>
<tr>
<td>Health and safety information</td>
<td>Relevant safety data and references as well as possibly necessary warning labels can be found in the safety data sheet no. 509160.</td>
</tr>
</tbody>
</table>

Specified Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Nominal Value</th>
<th>Unit</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curing time in SMC formulation</td>
<td>540 ± 90</td>
<td>s</td>
<td>PAD 4</td>
</tr>
</tbody>
</table>

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Storage
Stored in its sealed original container under cool (15 to 20 °C) and dry conditions away from light, the product has a shelf life of 1 year. Although the product may turn opaque and a sediment may form during storage, this does not lead to any deterioration in quality. If this occurs, the contents of the packaging unit should be thoroughly stirred and Initiator BK should be used in the form of a suspension or a solution in monomers (see also "Instructions and recommendations for use").

Packaging
50 kg metal drums with PE liners

These raw material properties are typical properties and, unless specifically indicated otherwise, are not to be considered as delivery specification.

General properties

Initiator BK is a tetraphenylethane derivative in which the central C-C bond is weakened by the steric pressure of the bulky substituents. When Initiator BK is heated, this C-C bond splits into radicals endothermically (with absorption of energy), a process which is reversible. In contrast to this, the peroxides and azo compounds commonly used to initiate polymerisation decompose into radicals exothermally (with release of energy) and in a self-accelerating manner, a process which is irreversible. Under unfavourable conditions, heating the initiator to above its starting temperature or mechanical impact may cause explosions. The use of Initiator BK poses no such risk to safety. When heated, the product decomposes in a controlled manner into the radicals which trigger polymerisation. In addition, the decomposition behaviour of Initiator BK, unlike that of peroxides, is hardly affected at all by the catalytic action of inorganic compounds such as rust.

Since the decomposition of Initiator BK is reversible and involves absorption of energy, the half-life of the fission reaction cannot be taken as a characteristic parameter for the activity of the initiator. Figure 1 shows the difference in decomposition behaviour between Initiator BK and a commonly used peroxide with no polymerisation partner. It should be noted that for reasons of safety only a 20 % peroxide solution was added to the retarding plasticiser. When Initiator BK was heated, the decomposition of its radicals did not cause the specified bath temperature of 140 °C to be exceeded, while the peroxide decomposes exothermally.

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giving rise to a peak temperature of around 200 °C under the test conditions.

**Fig. 1.:** Comparison of Initiator BK with a peroxide initiator
*) 1,1-di-t-butylperoxide-3,3,5-trimethylcyclohexane, 20 % in dibutyl phthalate

**Applications**

Initiator BK can be used wherever radical polymerisation processes with vinyl monomers, acrylic compounds or olefins are to be initiated in the temperature range 90 to 160 °C. The use of Initiator BK in sheet moulding compounds (SMCs) and other moulding materials (BMCs) has proved particularly effective. Compared to when conventional initiators are used, SMCs and BMCs containing Initiator BK show a much lower tendency to form bubbles and cracks when being moulded into thick-walled moulded parts. Initiator BK has also proved successful when used with curable coatings and as a reactive retarding agent for peroxides.
Metering and handling

We recommend that the contents of the packaging unit are stirred prior to use and that Initiator BK is applied in the form of a solution in monomers (see also "Instructions and recommendations for use"). The recommended addition is 0.75 - 2 %, depending on the binder content.

Instructions and recommendations for use

While the standard inorganic pigments and carbon black used for SMCs and BMCs have scarcely any influence on curing, certain organic pigments such as azo dyestuffs, Ceres® Red BB and HELIO Fast Black TW, may have such a strong inhibiting effect that complete curing can no longer take place. Pre-testing of the pigments for possible inhibition is therefore essential. If gelling and curing times of UP resins are to be extended, quinone inhibitors such as p-benzoquinone, toluquinone and naphthoquinone are recommended. On the other hand, the effectiveness of phenolic inhibitors, which are generally used to stabilise UP resins, is low. It is therefore possible to manufacture highly stable resins with phenolic inhibitors, which can then be polymerised through the addition of Initiator BK without gelling and curing times being extended too greatly. It is possible to accelerate polymerisation reactions started by Initiator BK by adding amines, amides or amidines(1).

Initiator BK is a supersaturated solution containing numerous active product components. During storage these active components may form a sediment, especially at low temperatures. When Initiator BK is processed, it should be borne in mind that this sediment is reactive and can initiate polymerisation. In particular when reactive mixtures are to be stored over a longer period of time (e.g. curable coatings) it must be taken into account that such a sediment is a source of reactive components. A high local initiator concentration can render the inhibition of the mixture ineffective so that curing of the mixture begins. In the case of curing compounds which are to be stored over long periods therefore, it is important to ensure that the Initiator BK/resin solution is homogeneous. This can be achieved by filtration, predissolving and stirring.

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Ceres

Bibliography:

(1) DE 2 650 173 A 1

Transport, toxicity and hazards

Please refer to our safety data sheet.
Labelling in accordance with the EEC directives:

R 10: Flammable.
S 23: Do not breathe vapour/spray.
S 38: In case of insufficient ventilation, wear suitable respiratory equipment.