



Initiators for acrylics manufacturing



Nouryon

Nouryon Creates Everyday Essentials

Nouryon is your partner in essential solutions for a sustainable future

Nouryon is a global, specialty chemicals leader. Markets and consumers worldwide rely on our essential solutions to manufacture everyday products, such as personal care, cleaning goods, paints and coatings, agriculture and food, pharmaceuticals, and building products. Furthermore, the dedication of approximately 7,650 employees with a shared commitment to our customers, business growth, safety, sustainability and innovation has resulted in a consistently strong financial performance. We operate in over 80 countries around the world with a portfolio of industry-leading brands.

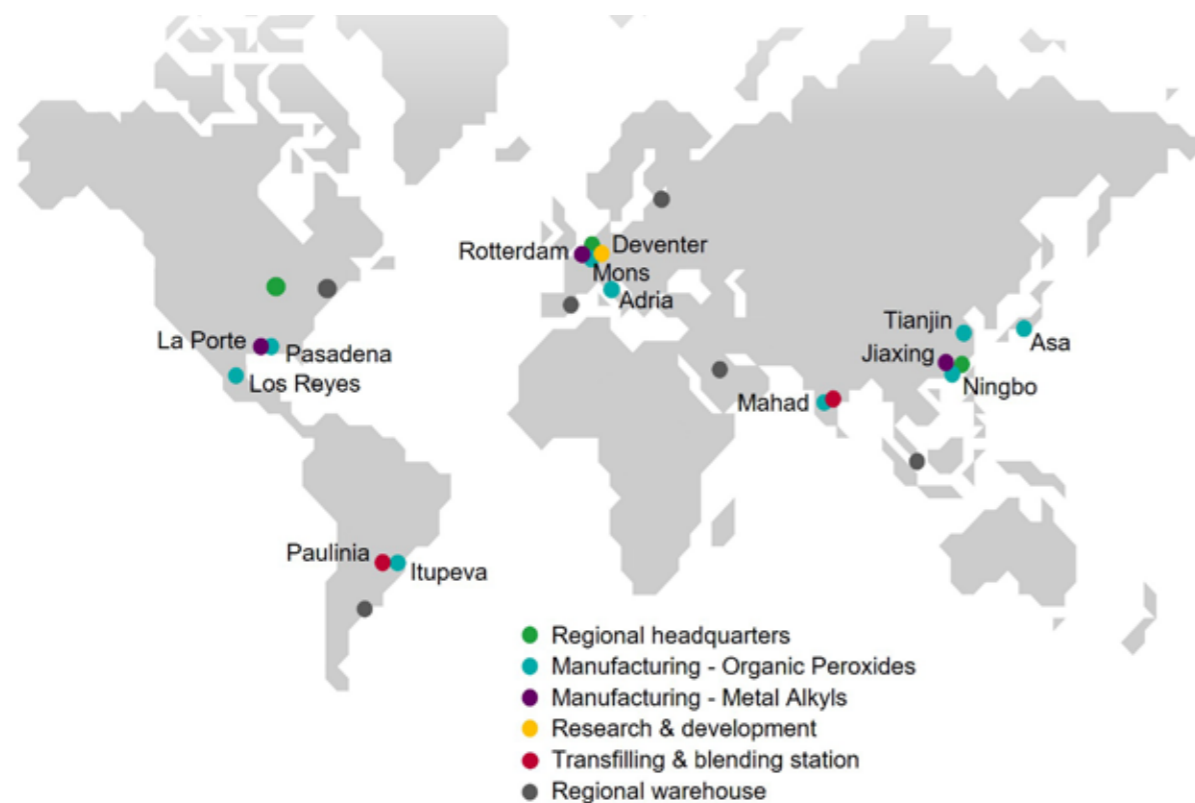
Within our Polymer Specialties business, we produce everyday essentials for the global polymer, recycling and polymer processing industries. We are among the world's leading producers of organic peroxides, metal alkyls and organometallic specialties, which are essential ingredients for the thermo-plastic, composite and rubber industries. We are widely known for our world-class products, including Laurox®, Trigonox®, Perkadox® and brands.



A global partner

Our manufacturing sites and distribution centers are found all around the globe. Our global distribution network allows us to deliver our products to you anywhere in the world. That's how we ensure security of supply and easy access to quality products wherever you are.

All our sites are ISO 9001 and ISO 14001 certified to ensure the highest product quality and strict compliance with environmental regulations. We continually invest in manufacturing techniques, high quality standards, safety, innovation, active technical support and a reliable supply chain.



Enabling the Polymer Cycle

Building on a sustainability driven strategy. We provide essential ingredients to enable the polymer cycle.



Contributing to a Sustainable Future

We partner with our customers, suppliers and employees to deliver innovative solutions, drive progress and create a safe and sustainable today and tomorrow for everyone.

Our 'Commitment to a Sustainable Future,' is based on three pillars:

		
IMPROVE	GROW	ENGAGE
Improve our safety and environmental performance	Innovate to create Sustainable Solutions, enabling customers to be more sustainable	Engage with customers, suppliers, employees, and society to drive progress
Key sustainable development goals: 	Key sustainable development goals: 	Key sustainable development goals: 
		

Our effort to **IMPROVE** our environmental performance includes ambitious targets:

Safety ambition: zero injuries, waste, and harm	
2025	
25% carbon emission reduction ⁶	70% low carbon energy ⁷
2030	
Carbon Neutral	10% reduction of water usage and waste generation ⁸
2050	
Net Zero carbon emissions	

⁶ Including carbon emissions from our operations (scope 1) and purchased energy use (scope 2)
⁷ Based on the portion from low carbon sources (biomass, renewable, and nuclear) compared with fossil-based sources as reported by our global manufacturing sites
⁸ Intensity measured on a per tons product basis
⁹ Reflects the percentage of innovation that is focused on sustainability

Polymerization Initiators for Acrylics

Laurox[®], Perkadox[®], Trigonox[®]

Nouryon's range of organic peroxides for the manufacture of acrylics is the world's largest. We cover classes such as peroxy(di) carbonates, diacyl peroxides, peroxyketals, peroxyesters, dialkyl peroxides and hydroperoxides. In addition we supply azo (N=N) and carbon-carbon (C-C) initiators.

We have a long history in organic peroxides, starting with dibenzoyl peroxide used for the bleaching of flour in the early 1920s. Since then, we have added many new organic peroxides to our product portfolio, including those which produce plastics used in everyday life. Today, we are the world's leading producer of organic peroxides. We are home to the best known brands in the business. Examples include Laurox[®], Perkadox[®] and Trigonox[®] brands.

Our products are used in a huge range of industrial and consumer goods, such as solvent and water based coating resins, acrylic sheets and castings, toner and inks, adhesives and sealants, acrylic fibers, super absorbers, detergents and flocculants and many others. Our range of initiators meet the requirements in each area of application, from polymerization temperature, rate of radical formation and storage facilities.

As a company of innovation, we have recently introduced new initiators, which have an improved performance in selectivity and HSE profile, including such products as Trigonox[®] 421 and Trigonox[®] 301.

Please visit nouryon.com for complete product listings. Formulations with phlegmatizers or concentrations other than those indicated can also be made available.

This product guide provides an overview of our main, commercially available initiators for the free radical polymerization of (meth)acrylate monomers.



Your Safety is Our Priority

Nouryon is recognized as the global leader in organic peroxide safety. Our proven success in safely handling organic peroxides is due to our long-term commitment to developing and maintaining high safety standards. We at Nouryon always place safety as our top priority.

Sharing our experience in safety is one of the most important resources we offer. Through our safety programs we provide expert advice on the handling of our products including:

- classroom review of safety and handling of organic peroxides
- consultation on storage and dosing facility design
- demonstrations on the safe use, handling and control of organic peroxides

Our Safety Research Laboratory in Deventer, The Netherlands is heavily involved in R&D, ensuring the development of safe products and processes. Studies are carried out, in order to provide a high level of safety in manufacturing, handling and transport of dangerous goods.

In general organic peroxides are thermally unstable compounds, decomposing at relatively low temperatures. However, knowledge of proper handling techniques, carefully designed facilities and thorough training of personnel can overcome the hazards. Personnel who understand and pay proper attention will be able to handle organic peroxides confidently and safely.

Storage temperatures

SADT: Self-Accelerating Decomposition Temperature

The SADT is the lowest temperature at which self-accelerating decomposition may occur with a substance in the packaging as used in transport.

Transportation temperatures are derived from the SADT according to the recommendations by the United Nations Committee of Experts on the Transport of Dangerous Goods.

T_s max.

The T_s max. given in the product list is the recommended maximum storage temperature at which the product is stable and quality loss will be minimal.

T_s min.

A minimum storage temperature (T_s min.) is given if phase separation, crystallization or solidification of the product is known to occur below the temperature indicated. We recommend that you store the product above the T_s min. indicated for quality and in some cases safety reasons.

T_{em}: Emergency temperature

The T_{em} is derived from the SADT and is the temperature at which emergency procedures must be implemented.

T_c Control temperature

The T_c is also derived from the SADT and is the maximum temperature at which the product can be safely transported. A T_c is not required if the SADT exceeds 50°C.

Both the T_{em} and T_c are related to safety and do not apply to product quality. To maintain product quality the recommended storage temperatures (T_s min. and max.) have to be observed.

UN Numbers

All products accepted for transport are assigned to generic entry numbers according to classification principles as described in the recommendations by the United Nations Committee of Experts on the Transport of Dangerous Goods. An explanation of all relevant UN numbers is given in Table 1.

Survey of thermal stability

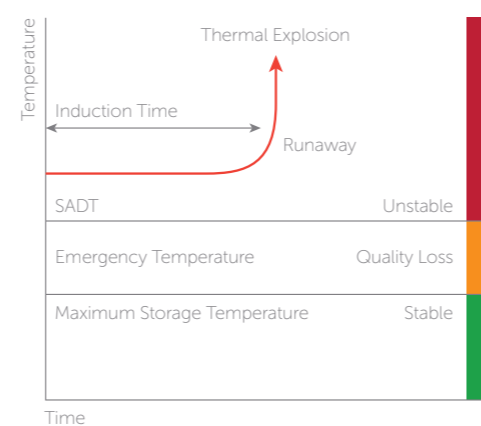


Table 1. Classification of organic peroxides

Un no.	Classification	Nouryon hazard rating	Maximum container size
3101	type B; liquid	Very high	25 kg (55 lb)
3103	type C; liquid		
3104	type C; solid	High	50 kg (110 lb)
3113	type C; liquid, temperature controlled		
3114	type C; solid, temperature controlled		
3105	type D; liquid		
3106	type D; solid	Medium	50 kg (110 lb)
3115	type D; liquid, temperature controlled		
3116	type D; solid, temperature controlled		
3107	type E; liquid	Low	400 kg (880 lb)
3117	type E; liquid, temperature controlled	Low	
3108	type E; solid		
3109	type F; liquid		
3110	type F; solid		
3119	type F; liquid, temperature controlled		
None	Non-dangerous good	No	Unrestricted

Self-reactive substances			
3234	type C; solid, temperature controlled	High	50 kg (110 lb)
3236	type D; solid, temperature controlled		



Packaging

We continuously develop new and innovative packaging to make logistics more efficient and according to safety standards beyond existing transport regulations. From bottles to tank trucks we offer a variety of packaging options for both liquid and solid organic peroxides.

Liquid organic peroxides

Liquid peroxides from us are available in packages shown in Table 2.

We also understand the need to innovate our packaging. For instance our Nourytainer®. Developed by us it is recognized as the world's benchmark in liquid organic peroxide packaging. We were also the first organic peroxide producer to introduce intermediate bulk containers (IBC's). And we're continually looking for new ways to optimize safe transport, handling and storage of organic peroxides.

Most recently we've led the way with our new unique composite IBC's for dilute type F organic peroxides. Due to their weight and dimensions, these IBC's offer benefits in safety and handling during transport and storage while giving all the advantages of our stainless steel containers. The specially designed lid, used as an emergency vent, is an Nouryon invention and has been patented. In addition, they are readily available and have a lower environmental impact.

We provide recollection and recycling, showing our commitment to developing new products and packages which are more sustainable, without compromising on performance.

Our continuous investment in refrigerated trucks, bulk tankers and dedicated reefers (refrigerated containers) specifically designed to safely transport our products is another demonstration of our commitment to security of supply.

Solid initiators

Standard packages for our solid initiators are shown in Table 3.

Most solid initiators are packaged in polyethylene bags inside non-returnable corrugated boxes. The number of bags per box varies, depending on the weight of initiator per bag.

For the availability of our products in IBC's, bulk or non-standard packages, please consult your Nouryon account manager.



Table 2. Standard packages for liquid peroxides

Package	Volume	Net Weight	Comments
Bottle	1 gallon*	7-8 lb	packaged as 4 polyethylene bottles per non-returnable carton
HDPE can	20-30 liter (5.3-8 gallon)	15-25 kg (6.8-11.3 lb)	single component, polyethylene container (Nourytainer®)
Akzopak	approx. 18 liter	20 kg	
Drum	200 liter	150 kg	steel drum
	220 liter	165-190 kg	returnable polyethylene drum
	15 gallon	100 lb	returnable polyethylene drum
	55 gallon	300-410 lb	polyethylene or steel drum
IBC	1000 liter	800-1000 kg	recollectable composite container (for emulsions and suspensions)
	1000 liter	800-1000 kg	recollectable, conductive composite container
	1250 liter	850-1000 kg	reusable stainless steel container
	330 gallon	2000 lb	reusable stainless steel container
Tank truck	7000 gallon 20 m ³	varies with product	for transport of bulk shipments of dilute type F organic peroxides

Table 3. Standard packages for solid initiators

Package	Net Weight	Comments
Carton	varies with product	polyethylene bags inside non-returnable cardboard box
Drum	20-25 kg (45-55 lb)	fiber drum

* Package sizes expressed in gallons and lb are only available in North America.

Different solutions in diluted peroxide formulations (see tables on page 12-21)

In diluted peroxide formulations the letter 'C' refers to Isododecane which is used exclusively in Europe, Middle East, India and Africa.

In the America's 'odorless mineral spirits' is used and products are indicated with "CH" to distinguish the different solvent.

In Asia our 'odorless mineral spirits' based products are indicated by "CL".



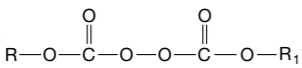
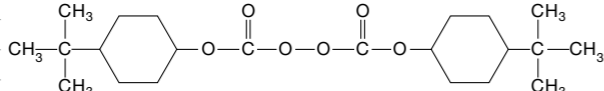
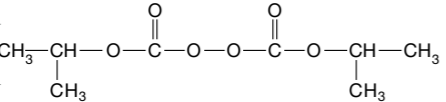
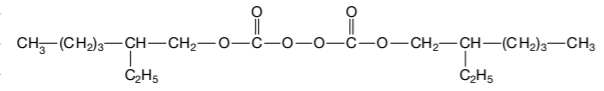
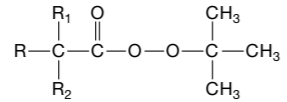
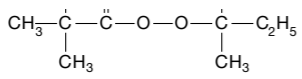
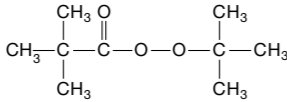
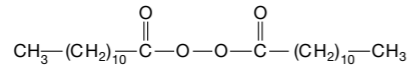
Main Areas of Application

End use		Coating resins					Sheets & castings			Toners & inks		Adhesives & sealants		Fibers	Super absorbers	Detergents & Flocculants, Ion exchange	Personal care	Lenses
Segment		Solvent & solution based				Water based	P(M)MA			Styrene-Acrylics toner resin		Water based	Solvent based	Acrylic & modacrylic	Water soluble resins	Water treatment	PMMA	Lenses
Application		Medium solids		High solids	Clear coat	Latex	1)	2)	3)	Inks	Inks	Adhesives & sealants	Adhesives & sealants	Fibers		Water treatment		Lenses
Process																		
Solution & solvent polymerisation		•	•	•	•	•	•			•		•		•				
Suspension & emulsion polymerisation						Emulsion		Suspension			Suspension		Both	Emulsion		Both		
Bulk & mass polymerization									•						•			•
Inversed emulsion & slurry polymerisation															•	•		
Temperature during polymerization		70-90	90-140	140-180	50-180	70-180	90						90-110		60-90	90-100		
Initiator	t½ 1 hr																	
Trigonox ADC	62																	•
Perkadox 16 / Perkadox 16S ¹¹	64								•				•		•	•		
Trigonox EHPS	64								•				•		•	•		
Trigonox 23 ^α	64	•			α	α	•	•	•	•	•							
Perkadox IPP	64																	•
Trigonox 125	72			•	•		•	•	•			•	•					
Trigonox 25	75	•	•		α	α	•	•	•				•					•
Laurox ¹¹	79	•	•		α	α	•	•	•	•	•	•	•	•	•	•	•	•
Perkadox AIBN	82	•	•		•		•	•	•	•	•	•	•	•	•	•	•	•
Perkadox AMBN ^{9 11 12}	84	•	•				•	•	•	•	•	•	•	•	•	•	•	•
Trigonox 141	86																	•
Trigonox 421 ^{α 10 12}	88	•	•			α	•	•	•	•	•	•	•	•	•	•	•	•
Trigonox 121 ^α	91	•	•		α	α	•	•	•	•	•	•	•	•	•	•	•	•
Perkadox L-W75 ^{6 11}	91	•	•		•	•			•	•	•	•	•		•	•	•	•
Trigonox 21S ^α	91	•	•		α	α	•	•	•	•	•	•	•			•		
Trigonox 27	93									•	•							
Perkadox ACCN	103	•	•				•											
Trigonox 29	105							•					•					
Trigonox 122	106			•	•													
Trigonox 131	113		•	•	•													
Trigonox 22	113												•					
Trigonox 42S	114		•	•	•	•	•	•	•							•		
Trigonox 133	114		•	•	•													
Trigonox D	116					•												
Trigonox BPIC	117		•	•	•								•					
Trigonox 117	117		•	•	•					•	•							
Trigonox 127 ⁶	118		•	•	•						•							
Trigonox F	119		•	•	•	•												
Trigonox C ⁶	122		•	•	•		•	•	•	•	•	•	•			•		
Perkadox BC-FF	132					•				•	•		•					
Trigonox 101	134																	
Trigonox B	141		•	•	•		•			•	•	•	•				•	
Trigonox 301	146		•	•	•							•	•					
Trigonox K-90	166					•												
Trigonox A-W70	185					•	•	•	•	•	•		•	•	•	•	•	•
Trigonox TAHP	190					•						•	•					

- Industry standard
- Recommended grade
- α Alpha branched (selective) peroxide. Relevant for high solid acrylics and clear coats
- 1 Molding & extrusion
- 2 Molding & extrusion to beads & powders
- 3 Casted & extruded sheet & injection and extrusion grades
- 4 General purpose
- 5 Higher temp polymerization for lower MW
- 6 Benzene containing decomposition products
- 7 For low VOC formulation
- 8 Monomer cut for suspension process
- 9 Less toxic decomposition product and better solubility than Perkadox AIBN
- 10 Maximized beta-scission for low polydispersity and optimized radical efficiency
- 11 Oil soluble peroxide for inversed suspension polymerization
- 12 Suitable alternative for Perkadox AIBN without formation of toxic decomposition products

Our Initiators for Acrylics

* see explanation on page 9

Product name	Chemical name [CAS number]	General data			Physical form	Storage data		Kinetic data T (°C) for t _{1/2}				Safety data				Standard package type		
		Molecular weight	Assay (%)	Active oxygen (%)		T _s max. (°C)	T _s min. (°C)	0.1 h	1.0 h	10 h	A (1/s)	E _a (kJ/mole)	SADT (°C)	Tem (°C)	T _c (°C)	UN No.	See page 9	
TRIGONOX ADC-NS30	Mixture of peroxydicarbonates [78350-78-4; 19910-65-7; 105-64-6]	398.5		4.01				80	62	45	7.69E+15	125.61						
TRIGONOX ADC-NS60			30	2.09	solution in diethylene glycol bis(allyl carbonate)	-20	-30						0	-10	-20	3115	20 kg Akzopak	
			60	4.32	solution in diethylene glycol bis(allyl carbonate)	-20	-30						0	-10	-20	3115	4 x 8 lb box	
PERKADOX 16S	Di(4-tert-butylcyclohexyl) peroxydicarbonate [15520-11-3]	398.5		4.01				82	64	48	7.44E+15	126.39						
PERKADOX 16			96	3.85	powder	20							40	35	30	3114	carton	
			95.5	3.83	powder	20							40	35	30	3114	carton	
PERKADOX IPP-RAV27	Diisopropyl peroxydicarbonate [105-64-6]	206.2		7.76				82	64	47	3.35E+15	124.01						
PERKADOX IPP-CR27			27	2.10	liquid	-15	-15						5	-5	-15	3115	HDPE can	
			27	2.10	liquid	-15	-15						5	-5	-15	3115	HDPE can	
TRIGONOX EHPS	Di(2-ethylhexyl) peroxydicarbonate [16111-62-9]]	244.4		6.55				84	64	46	1.52E+14	115.47						
			98	4.53	liquid	-20							0	-10	-20	3113	HDPE can	
TRIGONOX 23	tert-Butyl peroxyneodecanoate [26748-41-4]	244.4		6.55				84	64	46	1.52E+14	115.47						
TRIGONOX 23-C75*			95	6.22	liquid	-10	-30						15	5	-5	3115	HDPE can	
			75	4.91	solution	-10	-20						20	10	0	3115	HDPE can	
TRIGONOX 125-C75	tert-Amyl peroxyvalate [29240-17-3]	188.3		8.50				91	72	55	4.12E+15	127.76						
			75	6.37	solution in odorless mineral spirits	-10	-30						25	15	10	3113	HDPE can	
TRIGONOX 25-C75*	tert-Butyl peroxyvalate [927-07-1]	174.2		9.18				94	75	57	7.09E+14	123.59						
			75	6.89	solution	-5	-15						20	10	0	3113	HDPE can	
LAUROX	Dilauroyl peroxide [105-74-8]	398.6		4.01				99	79	61	3.92E+14	123.37						
			99	3.97	flakes	30							50	45	40	3106	carton	

Our Initiators for Acrylics

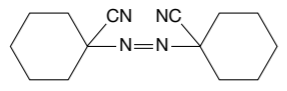
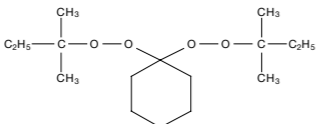
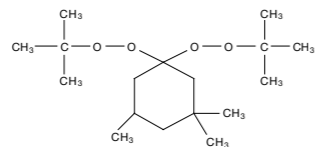
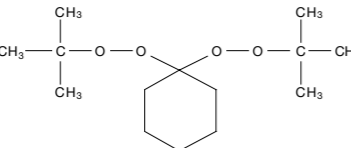
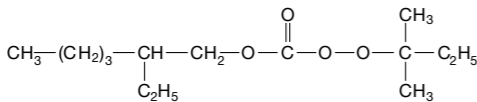
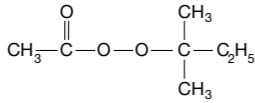
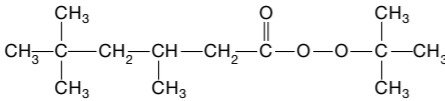
* see explanation on page 9

** 3117 in US

Product name	Chemical name [CAS number]	General data			Physical form	Storage data		Kinetic data T (°C) for t _{1/2}				Safety data				Standard package type See page 9	
		Molecular weight	Assay (%)	Active oxygen (%)		T _s max. (°C)	T _s min. (°C)	0.1 h	1.0 h	10 h	A (1/s)	E _a (kJ/mole)	SADT (°C)	T _{em} (°C)	T _c (°C)		UN No.
PERKADOX AIBN	2,2'-Azobis(isobutyronitrile) [78-67-1]	164.2	98		solid	25		101	82	64	2.89E+15	130.23	50	45	40	3234	carton / fiber drum
PERKADOX AMBN PERKADOX AMBN-GR	2,2'-Azobis(2-methylbutyronitrile) [13472-08-7]	192.3	98		solid	25		104	84	66	1.38E+15	128.93	45	40	35	3236	carton
			98		granules	25							45	40	35	3236	carton / fiber drum
TRIGONOX 421	1,1,3,3-Tetramethylbutyl peroxy-2-ethylhexanoate [22288-43-3]	272.4	90	5.87	liquid	5	-20	109	88	69	1.62E+14	123.80	30	20	15	3115	HDPE can
TRIGONOX 121	tert-Amyl peroxy-2-ethylhexanoate [686-31-7]	230.3	95	6.95	liquid	5	-20	111	91	73	1.77E+15	132.11	35	25	20	3115	HDPE can
PERKADOX L-W75	Dibenzoyl peroxide [94-36-0]	242.2	75	6.61	wet powder	40		113	91	71	6.94E+13	122.35	80			3104	carton
TRIGONOX 21S TRIGONOX 21-C50*	tert-Butyl peroxy-2-ethylhexanoate [3006-82-4]	216.3	97	7.40	liquid	10	-30	113	91	72	1.54E+14	124.90	35	25	20	3113	HDPE can
			50	3.70	solution	10	-30						40	35	30	3119**	HDPE can / IBC
TRIGONOX 27	tert-Butyl peroxydiethylacetate [2550-33-6]	188.3	96	8.50	liquid	15	-30	113	93	75	2.45E+15	134.00	35	25	20	3113	HDPE can

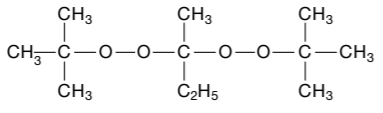
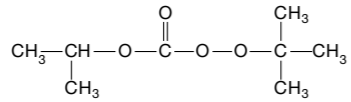
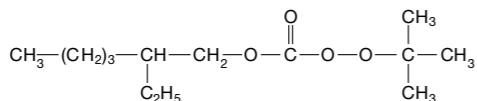
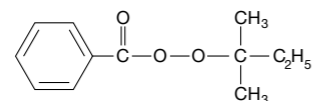
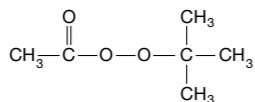
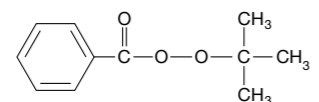
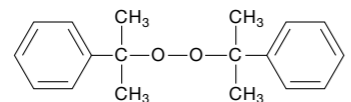
Our Initiators for Acrylics

* see explanation on page 9

Product name	Chemical name [CAS number]	General data			Physical form	Storage data		Kinetic data T (°C) for t1/2				Safety data				Standard package type See page 9		
		Molecular weight	Assay (%)	Active oxygen (%)		T _s max. (°C)	T _s min. (°C)	0.1 h	1.0 h	10 h	A (1/s)	E _a (kJ/mole)	SADT (°C)	T _{em} (°C)	T _c (°C)		UN No.	
PERKADOX ACCN	1,1'-Azodi(hexahydrobenzotriazole) [2094-98-6]	244.3						123	103	85	1.10E+16	142.						
			98		powder		35						80			3226	fiber drum	
																		
TRIGONOX 122-C80	1,1-Di(tert-amylperoxy)cyclohexane [15667-10-4]	244.3	80	8.88	solution		30	126	106	87	3.29E+15	139.46	55			3103	HDPE can	
																		
TRIGONOX 29-C75*	1,1-Di(tert-butylperoxy)-3,3,5-trimethylcyclohexane [6731-36-8]	302.5	75	7.93	solution		25	128	105	85	7.59E+13	127.52	60			3103	HDPE can	
TRIGONOX 29-C90*			90	9.52	solution		25											60
																		
TRIGONOX 22-C50*	1,1-Di(tert-butylperoxy)cyclohexane [3006-86-8]	260.4	50	6.14	solution		25	134	113	94	3.47E+15	142.40	60			3103	HDPE can	
TRIGONOX 22-C80*			80	9.83	solution		25											60
																		
TRIGONOX 131	tert-Amylperoxy 2-ethylhexyl carbonate [70833-40-8]	260.4	94	5.77	liquid		20	134	113	95	2.22E+16	148.41	55			3105	HDPE can	
																		
TRIGONOX 133-CK60	tert-Amyl peroxyacetate [690-83-5]	146.2	60	6.57	solution		30	134	114	96	6.59E+16	152.16	60			3105	HDPE can	
																		
TRIGONOX 42S	tert-Butyl peroxy-3,5,5-trimethylhexanoate [13122-18-4]	230.3	97	6.74	liquid		25	135	114	94	1.94E+15	140.78	55			3105	HDPE can	
																		

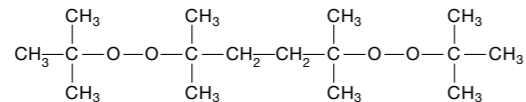
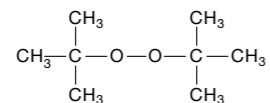
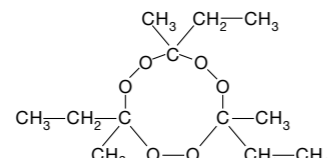
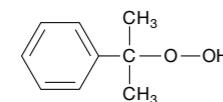
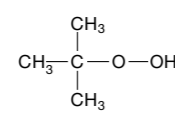
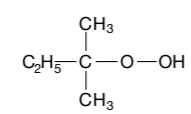
Our Initiators for Acrylics

* see explanation on page 9

Product name	Chemical name [CAS number]	General data			Physical form	Storage data		Kinetic data T (°C) for t _{1/2}				Safety data				Standard package type See page 9		
		Molecular weight	Assay (%)	Active oxygen (%)		T _s max. (°C)	T _s min. (°C)	0.1 h	1.0 h	10 h	A (1/s)	E _a (kJ/mole)	SADT (°C)	T _{em} (°C)	T _c (°C)		UN No.	
TRIGONOX D-C50	2,2-Di(tert-butylperoxy)butane [2167-23-9] 	234.3	50	6.83	solution	30		136	116	98	9.30E+16	154.08		70			3103	HDPE can
TRIGONOX BPIC-C75*	tert-Butylperoxy isopropyl carbonate [2372-21-6] 	176.2	75	6.81	solution	25	-20	137	117	98	2.49E+16	150.15		70			3103	HDPE can
TRIGONOX 117	tert-Butylperoxy 2-ethylhexyl carbonate [34443-12-4] 	246.3	95	6.17	liquid	20		137	117	98	4.07E+16	151.72		60			3105	HDPE can
TRIGONOX 127	tert-Amyl peroxybenzoate [4511-39-1] 	208.3	94	7.22	liquid	20		139	118	99	8.38E+15	147.02		60			3103	HDPE can
TRIGONOX F-C50*	tert-Butyl peroxyacetate [107-71-1] 	132.2	50	6.05	solution	10	-15	139	119	100	1.57E+16	149.36		70			3103	HDPE can
TRIGONOX C	tert-Butyl peroxybenzoate [614-45-9] 	194.2	98	8.07	liquid	25	10	142	122	103	2.23E+16	151.59		60			3103	HDPE can
PERKADOX BC-FF	Dicumyl peroxide [80-43-3] 	270.4	99	5.86	crystals	30		154	132	112	9.24E+15	152.67		75			3110	carton

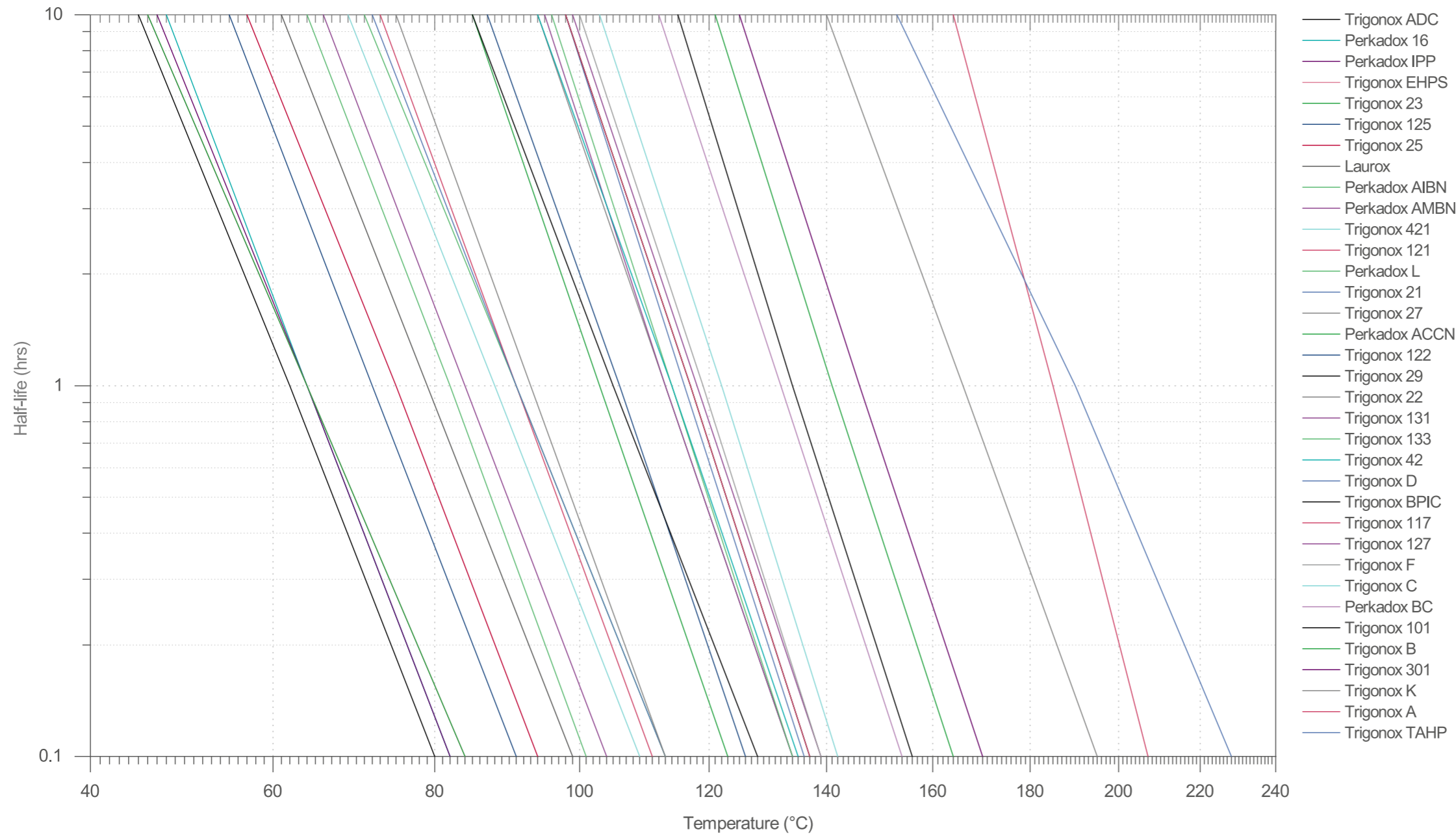
Our Initiators for Acrylics

* see explanation on page 9

Product name	Chemical name [CAS number]	General data			Physical form	Storage data		Kinetic data T (°C) for t1/2				Safety data				Standard package type
		Molecular weight	Assay (%)	Active oxygen (%)		T _s max. (°C)	T _s min. (°C)	0.1 h	1.0 h	10 h	A (1/s)	E _a (kJ/mole)	SADT (°C)	T _{em} (°C)	T _c (°C)	UN No.
TRIGONOX 101	2,5-Dimethyl-2,5-di(tert-butylperoxy)hexane [78-63-7]	290.4	92	10.14	liquid	40	10	156	134	115	1.68E+16	155.49	80		3103	HDPE can / HDPE drum
																
TRIGONOX B	Di-tert-butyl peroxide [110-05-4]	146.2	99	10.83	liquid	40	-30	164	141	121	4.20E+15	153.46	80		3107	HDPE can / steel drum
																
TRIGONOX 301	3,6,9-Triethyl-3,6,9-trimethyl-1,4,7-triperoxonane [24748-23-0]	264.3	41	7.45	solution in isoparaffins	40	10	170	146	125	1.02E+15	150.23	110		3105	HDPE can
																
TRIGONOX K-80	Cumyl hydroperoxide [80-15-9]	152.2	80	8.40	solution in aromatic solvent mixture	40	-30	195	166	140	1.15E+12	132.56	70		3109	HDPE can
TRIGONOX K-90			90	9.46	solution in aromatic solvent mixture	40	-30									
																
TRIGONOX A-W70	tert-Butyl hydroperoxide [75-91-2]	90.1	70	12.43	solution in water	35	0	207	185	164	3.18E+17	186.01	80		3109	HDPE can / HDPE drum
																
TRIGONOX TAHP-W85	tert-Amyl hydroperoxide [3425-61-4]	104.1	85	13.06	solution in water	30	-5	228	190	153			80		3109	HDPE drum
																

Kinetic Data/Half-life Chart

The most important characteristic of a polymerization initiator is its rate of decomposition expressed by its half-life ($t_{1/2}$). The half-life is the time required to reduce the original amount of peroxide at a given temperature by 50%.



Kinetic Data

With the exception of hydroperoxides, the half-life is determined by differential scanning calorimetry-thermal activity monitoring (DSC-TAM) of a dilute solution of the initiator in monochlorobenzene. Kinetic data of the decomposition of hydroperoxides in monochlorobenzene are determined titrimetrically.

The tables in this catalog list the temperatures at which the half-lives are 0.1 hour, 1.0 hour and 10 hours.

The half-life can be calculated from the Arrhenius equation

$$k_d = A \cdot e^{-E_a/RT} \text{ and } t_{1/2} = \ln 2/k_d$$

The Arrhenius frequency factor (A) and activation energy (E_a) are given in the tables on pages 12-21.

The residual concentration of the initiator can be calculated by means of the equation

$$[I] = [I_0] \cdot e^{-k_d t}$$

The initiators in the tables on pages 12-21 are arranged in descending order of activity, based on the 1.0 hour half-life temperature.

k_d = rate constant for the initiator dissociation in s^{-1}
 A = Arrhenius frequency factor in s^{-1}
 E_a = Activation energy for the initiator dissociation in J/mole
 R = 8.3142 J/mole.K
 T = temperature in K
 $t_{1/2}$ = half-life in s

$[I_0]$ = original initiator concentration
 $[I]$ = initiator concentration at time t
 t = time measured from the start of decomposition in s

Trigonox® 421

Diving into a sustainable future

Initiators for Cast Acrylic Lenses

We are a leading supplier of organic peroxides for the manufacturing of polymer acrylics. A particular acrylics segment is the manufacturing of lenses.

The manufacturing of acrylic lenses requires dedicated products to fulfil the high market quality standards. We provide a dedicated series of peroxides which are used in this segment and which are shown in the table below.

Trigonox® ADC and Perkadox® IPP are the products of choice for all major manufacturers in this segment.

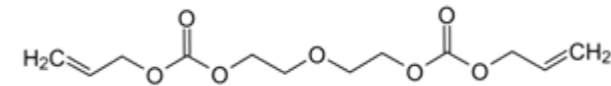
The products are all phlegmatized with diethylene glycol bis (allylcarbonate) which is the major monomers used for the manufacturing of acrylic lenses.

The phlegmatizer will therefore fully incorporate in the 3D polymer network during the polymerization. This way it assures the desired refractive index of the polymer, reaching excellent transparency with no haze and discoloration of the lens.

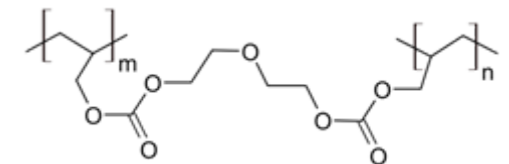
With Trigonox® ADC and Perkadox® IPP formulations the polymerization process is under control to meet shrinkage requirements and secure easy and safe mold release.

Some grades, depending on the region, are available in different concentrations and packaging types. Please contact your local Nouryon sales representative for further details.

The monomer: diethylene glycol bis (allylcarbonate):



The polymer: allyl diglycol carbonate (ADC)



As a company of innovation we have a stream of new, high-value products and technologies, including Trigonox® 421, our latest generation of organic peroxides for acrylic polymerization and polymer polyols production. Trigonox® 421 is an eco-premium alternative to commonly used azo initiators.

- TMSN free
- No toxic decomposition products
- Drop-in replacement for AIBN
- Easy to dose liquid

nouryon.com

Nouryon



Leading the Way in Safety



Nouryon is recognized as the global leader in organic peroxide safety and your trusted supplier of Butanox®, Cadox®, Perkadox® and Trigonox® products. We always place safety as our top priority.

Sharing our experience in safety is one of the most important resources we offer. Classroom reviews of safety and handling of organic peroxides, online trainings, consultation on storage and peroxide dosing equipment as well as demonstrations and publications on the safe use and handling of organic peroxides are just some of the services we offer. Please contact your Nouryon representative or nouryon.com for more information.

How to store peroxides



- Store in a cool room away from direct sunlight.
- Observe maximum and minimum storage temperature as printed on the packaging and SDS.
- Leave in the original packaging.
- Close packaging after use.



- Do not store together with accelerators or other chemicals.
- Do not mix peroxides with accelerators.
- Avoid any contact with dust, metal or other chemicals.



How to handle peroxides



- Wear safety goggles.
- Wear appropriate protective gloves and clothing.
- Remove spillages immediately.
- Only use compatible materials when handling.



- Do not smoke.
- Avoid heat sources.
- Avoid open fire.
- Never heat peroxides.

Scan QR code to watch our short video on how our safety services can support you.



In case of emergency, call the following telephone number: **+31 570 679211** or **+1 800 424 9300**

How to act in case of:



Fire

Alert fire department. Fight small fire with powder or carbon dioxide and apply water.



Spillage

Liquids: absorb with inert material and add water.
Solids/pastes: take up with compatible aids and add water. Move to safe place and arrange disposal as soon as possible.



Skin contact

Wash with water and soap.



Eye contact

First rinse with water for at least 15 minutes. Always seek medical attention.



Ingestion

Drink large amounts of water and consult doctor immediately. Do not induce vomiting.

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

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Additional information

Please visit nouryon.com for complete product listings, Product Data Sheets (PDS) and Safety Data Sheets (SDS). Formulations with phlegmatizers or concentrations other than those indicated can also be made available.

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Nouryon

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[nouryon.com](https://www.nouryon.com)