



UNITED INITIATORS

driving your success



NOROX[®]

Thermoset Applications
High Heat Cure

Driving your success

Founded in 1911, United Initiators (UI) is the only global producer of high-quality organic peroxides and persulfates with locations in four continents – Asia, Australia, Europe and North America.

Driving your success is based on a threefold approach: reliable service, product development innovation and responsible care & safety. It all starts with using UI's high-quality peroxide chemicals and leveraging our expertise for innovative solutions in research, production and service. UI is a preferred provider of choice in polymerization, cross-linking, chemical synthesis, bleaching or other peroxide oxidation applications. Together, this approach provides competitive advantage and drives your company's success to the next level.

Reliable Service & Product Development Innovation

UI continuously optimizes our operations and supply chain management while strengthening operational skills, teamwork and communications for improved performance such as on time and on budget for customer product readiness and satisfaction. Our global footprint and technology capabilities support responsive in-person and online services. Additionally, our best practices in product and safety training offerings ensure your staff will handle our products with the necessary care and precautions. Consulting and collaborating are value-added services that can improve your operational efficiencies and productivity, and solve unique product challenges. Product development innovation is focused on delivering added value by extending product performance and broadening product applications.

Responsible Care & Safety

Producing peroxides requires a continuous and steadfast focus on safety throughout our company. Safety awareness is everyone's top priority so safety and environmental standards are integrated into UI's human, technology, capital, process and product development initiatives. For example, UI develops our entire operating sequence into a seamless process: from design and development to safe delivery, storage and byproduct disposal. Our goal is to keep our people and their work environments safe and healthy. Our environmental and integrity standards are high and apply globally. Working closely with our surrounding communities is a key strategy for developing our corporate policies.



**More than 100 years -
A Culture of Continuity and Change**

Our history has been marked by constant and, sometimes, profound changes, without sacrificing tradition and key principles. United Initiator's mission is to become the provider of choice in markets that use high-quality peroxide solutions.

UI provides a consistent framework for people, plants, processes, production and performance. Our cornerstone is to remain a benchmark in the industry for: safety, quality, efficiency and deliverable service systems.

1911

Elektrochemische Werke München



1961

Laporte Organics



1968

Peroxid-Chemie

Peroxid-Chemie

1994

Laporte acquires Aztec Catalysts from Phillips Petroleum



2001

degussa

degussa.

2007

Evonik Industries



2008

United Initiators



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2011

VC acquires majority stake



2012

Acquisition of Syrgis



1909

Patent for the production of Hydrogen Peroxide

1970

Joint Venture of Laporte and SOLVAY forms Interlox

1911

Foundation of Elektrochemische Werke Adolph & Pietzsch

1992

Demerger of the Interlox Group, Peroxid-Chemie becomes a 100% Laporte subsidiary

1928

Merck AG becomes shareholder. Conversion into EWM AG

2001

Takeover of Laporte by Degussa

1930s

Inorganic Peroxide production

2004

Peroxid-Chemie becomes Degussa Initiators

1935

Breakthrough: Concentration of Hydrogen Peroxide solutions up to 81%, fuel for submarines and airplanes

2007

Degussa becomes Evonik Industries

1936

Production of sodium percarbonate begins

2008

Sale to Speyside Equity. Birth of United Initiators

1938

Production of carbamide peroxide

2011

Vision Capital becomes majority shareholder (81%)

1954

Entry into the field of organic chemistry (Organic Peroxides)

2012

Acquisition of Syrgis Performance Initiators

1961

Takeover by Laporte Industries, new Hydrogen Peroxide process

PRODUCT CODE	DESCRIPTION	ACTIVE OXYGEN CONTENT	PEROXIDE CONTENT	SAFETY DATA SADT	Recommendation
DIALKYL PEROXIDES		%	%	°F/°C	
NOROX 305	Technically pure flake	4.0	99	122 / 50	
NOROX DTBP	An excellent source of free radicals above 100°C	10.8	99	167 / 75	
NOROX DTAP	t-Amyl version of DTBP	8.7	96	194 / 90	
Dibenzoyl peroxide – CAS No 94-36-0					
BENOX L40LV	40%, sprayable BPO dispersion	2.6	40	>122 / 50	
BENOX B-50	50% BPO paste in white color	3.3	50	>122 / 50	
BENOX B-55	55% BPO paste in a plasticizer	3.6	55	>122 / 50	
BENOX C-50	50% BPO free flowing, non-caking powder with a phthalate ester plasticizer	3.3	50	140 / 60	
BENOX A-80	80% BPO granules in water	5.2	79	>149 / 65	
BENOX A-75	75% BPO granules in water	5.0	75	>149 / 65	
BENOX A-70	70% BPO granules in water	4.5	70	>149 / 65	
PERESTERS					
tert-Butyl perbenzoate – CAS No 4511-39-1					
NOROX TBPB	Efficient perester, "kicker", helps reduce residual styrene	8.1	>98	140 / 60	
NOROX P-20	Promoted TBPB for elevated temperature processes with cobalt; ETA sub for 410	6.6	80	140 / 60	
tert-Amyl perbenzoate – CAS No 614-45-9					
NOROX TAPB	High efficient perester, lowest residual styrene levels	7.6	98	149 / 65	
tert-Butyl peroxy-2-ethylhexyl carbonate – CAS No 34443-12-4					
NOROX 400	High efficient, low TOC-emission	6.4	97	158 / 70	
tert-Amyl peroxy-2-ethylhexanoate – CAS No 686-31-7					
NOROX 401	t-Amyl version, better cure, lower residual styrene	6.2	97	131 / 55	
tert-Butyl peroxy-2-ethylhexanoate – CAS No 3006-82-4					
NOROX 410	Fast curing perester for reduced cycle times	7.3	99	95 / 35	
NOROX 410-50 OMS	50% diluted in Odorless Mineral Spirits (OMS) for better metering	3.8	50	104 / 40	
tert-Amyl peroxy-2-ethylhexanoate – CAS No 686-31-7					
NOROX 411	t-Amyl version for lower residual styrene, better cure	7.3	99	104 / 40	
NOROX 411-75 OMS	25% dilution in OMS for better metering	5.2	75	95 / 35	
tert-Butyl peroxyperneodecanoate – CAS No 26748-41-4					
NOROX 420-75 OMS	75% solution in OMS, fast starter, economical	6.2	95	59 / 15	
tert-Butyl peroxy-3,5,5-trimethylhexanoate – CAS No 13122-18-4					
NOROX 425	Environment friendly, high efficient perester, drinking water application	6.9	99	140 / 60	
PEROXYDICARBONATES					
Di(4-tert.butylcyclohexyl)peroxydicarbonate – CAS No 15520-11-3					
NOROX 600	Fast kick off peroxide for two-step curing	3.8	>96	113 / 45	
NOROX 600CL2	Class II – Fast kick off peroxide for two step curing	3.55	89	104 / 40	
Dimyrisyl peroxydicarbonate – CAS No 53220-22-7					
NOROX 605	Technically pure flake, low kick off temperature, economical	3	97	95 / 35	
NOROX TBIC	Most efficient styrene scavenger	6.8	75	140 / 60	
PERKETALS					
1,1-Di(tert.butylperoxy)cyclohexane – CAS No 3006-86-8					
NOROX 505-80	Hot curing initiator, long pot life, less affected by fillers and pigments	9.7	80	140 / 60	
1,1-Di(tert.butylperoxy) 3,3,5-trimethylcyclohexane – CAS No 6371-36-8					
NOROX 500-75 OMS	Most efficient perketal, diluted version	5.3	50	158 / 70	
NOROX 802-75P	Most useful for pigmented systems above 100°C for Pultrusion, SMC/BMC	6.3	75	104 / 40	

Safety Information

Half-life

Peroxide decomposition rates are commonly reported in terms of half-life time or when 50% of the peroxide has decomposed at a certain temperature. Recommended organic peroxide heat temperatures commonly reflect the half-life time at 10 hours, 1 hour and 1 minute. The higher the half-life temperature, the more stable the peroxide. Half-life temperatures can vary based on formulations and solvents.

Using the Arrhenius equation, acronyms related to half-life time include:

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

k_d : Rate constant of the peroxide dissociation

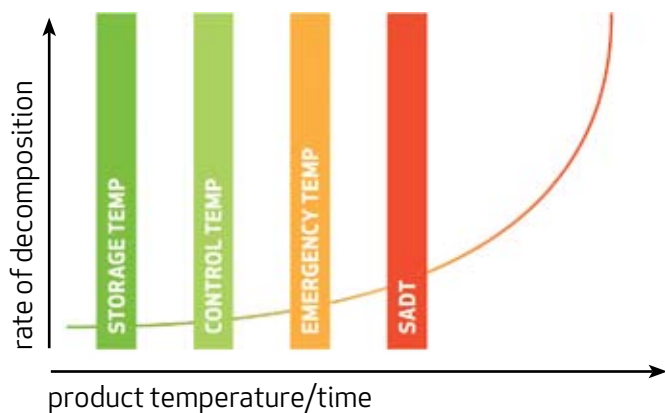
A: Arrhenius frequency factor

E_A : Activation energy for the dissociation

R: Ideal gas constant

T: Temperature

$t_{1/2}$: Half-life time



Controlling the temperature is the most important constant. If the temperature is maintained well below its self-accelerating decomposition temperature (SADT), most hazards are avoided when shipping, handling or storing. For storage over a longer period of time, follow the manufacturer's temperature recommendations.

Self-Accelerating Decomposition Temperature (SADT)

The SADT is the lowest constant temperature for self-accelerating decomposition when transporting packaged peroxides. At the SADT, when elevated heat temperatures from decomposition exceed the heat loss, over time, the peroxide's temperature increases and it decomposes faster or self accelerates. The final decomposition may be uncontrollable.

Minimum/Maximum recommended storage temperatures

The maximum recommended storage temperature is lower than the control temperature for quality assurance purposes not safety. Keep in mind, some liquid or paste organic peroxides must not be stored below a certain minimum temperature as turbidity, phase separation, crystal deposits or solidification can occur.

Control Temperature (T_c)

The T_c is the maximum transportation temperature recommended for the product's estimated time of arrival. T_c is not required if the SADT exceeds 50°C (122°F). Generally, the T_c mirrors SADT canister guidelines:

$$T_c = \text{SADT minus } 20^\circ\text{C if SADT} < 20^\circ\text{C}$$

$$T_c = \text{SADT minus } 15^\circ\text{C if SADT} < 35^\circ\text{C}$$

$$T_c = \text{SADT minus } 10^\circ\text{C if SADT} < 50^\circ\text{C}$$

SADT transportation temperatures are based on recommendations by the UN Committee of Experts on the Transport of Dangerous Goods.

Emergency Temperature (T_e)

The Control Temperature, T_c , is supplemented by an Emergency Temperature, T_e , which is higher than the T_c but still well below the SADT. The T_c may be exceeded if maintenance is necessary or until alternative cooling such as dry or wet ice is available. However, if the T_e is reached, emergency procedures must be implemented immediately – for instance, cooling down the organic peroxides.

PRODUCT CODE	CHEMICAL NAME	STORAGE TEMP	EA [KJ/MOL]	HALF LIFE TIME [°F/°C]		
				10H	1H	1MIN
BENOX	Dibenzoyl-peroxide	●	126	162/72	196/91	266/130
NOROX 305	Dilauroyl-peroxide	●	126	144/62	176/80	248/120
NOROX 401	tert.Amylperoxy-(2-ethylhexyl)carbonate	●	151	203/95	235/113	302/150
NOROX 415	2,5-Dimethyl-2,5-di(2-ethylhexanoylperoxy)hexane	●	137	153/67	183/84	257/125
NOROX 411	tert.Amylperoxy-2-ethylhexanoate	●	126	162/72	196/91	266/130
NOROX 410	tert.Butylperoxy-2-ethylhexanoate	●	135	165/74	198/92	266/130
NOROX 400	tert.Butylperoxy-(2-ethylhexyl)carbonate	●	128	212/100	252/122	347/175
NOROX 420-75	tert. Butylperoxy-neodecanoate 75% ASSAY	●	121	117/47	147/64	212/100
NOROX 425	tert. Butylperoxy-3,5,5-trimethyl-hexanoate	●	147	212/100	246/119	320/160
NOROX 425 PR	tert. Butylperoxy-3,5,5-trimethyl-hexanoate	●	147	212/100	246/119	320/160
NOROX 500-75	1,1-Di(tert.butylperoxy)-3,5,5-trimethyl-cyclohexane	●	143	203/95	237/114	311/155
NOROX 505-80	1,1-Di(tert.butylperoxy)cyclohexane	●	138	207/97	243/117	320/160
NOROX AZOX	Acetylacetone Peroxide	●	N/A*	N/A*	N/A*	N/A*
NOROX CHP	Cumyl Hydroperoxide	●	>75**	300/149	358/181	424/218
NOROX DCP	Dicumyl-peroxide	●	152	241/116	277/136	347/175
NOROX DHBP	2,5-Dimethyl-2,5-di(tert.butylperoxy)hexane	●	142	248/120	288/142	374/190
NOROX DTAP	Di(tert.amyl)peroxide	●	129	244/118	288/142	374/190
NOROX DTBP	Di(tert.butyl)peroxide	●	152	257/125	295/146	374/190
NOROX MEKP	Methyl Ethyl Ketone Peroxides	●	N/A*	N/A*	N/A*	N/A*
NOROX Pulcat	Methylisobutylketoneperoxide	●	125	194/90	230/110	311/155
NOROX TAPB	tert.Amylperoxy-benzoate	●	143	216/102	252/122	320/160
NOROX TBIC	tert. Butylperoxy-isopropylcarbonate	●	138	207/97	243/117	320/160
NOROX TBPB	tert. Butylperoxy-benzoate	●	143	219/104	255/124	329/165
NOROX P-20	Accelerated tert. Butylperoxy-benzoate	●	143	192/89	226/108	261/127
NOROX TBHP	tert. Butyl-hydroperoxide	●	149	343/173	392/200	500/260
PEROXYDICARBONATES						
NOROX 600	Di(4-tert.butylcyclohexyl)peroxydicarbonate	●		106/41	135/57	194/90
NOROX 600CL2	Di(4-tert.butylcyclohexyl)peroxydicarbonate	●		125/52	152/67	212/100
NOROX 605	Dimyrstylperoxydicarbonate	●		106/41	135/57	194/90
NOROX 608-75	Di(2-ethylhexyl)peroxydicarbonate 75% ASSAY	●		106/41	135/57	194/90

Color code for storage temperature:

● = Deep refrigeration ● = Moderate refrigeration ● = Ambient temperature For precise values, see specific product data sheets.

*No single values are stated due to the multi-species nature of these products.

**Hydroperoxides can be autocatalytic, therefore activation energy can vary with conditions and no single value is stated.



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Plant



Office and plant

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