



# Essential ingredients for PVC production



Trigonox<sup>®</sup>, Perkadox<sup>®</sup>, Laurox<sup>®</sup>, Active<sup>®</sup>,  
DCloud<sup>®</sup>, Ethapol<sup>®</sup> and Noxol<sup>®</sup>

**Nouryon**



# Essential ingredients for PVC production

Polyvinyl chloride (PVC) is everywhere in modern society and in a wide variety of applications, including products we use every day like pipes, windows, siding and flooring. It is produced through the polymerization of vinyl chloride monomer with the help of an organic peroxide initiator. Nouryon is the largest global producer of **polymerization initiators** to produce PVC offering a wide range of products. Our well-known brands are: Trigonox®, Perkadox® and Laurox®.

A special fast peroxide, Trigonox 187, is used in the **Continuous initiator Dosing (CiD)** technology that increases PVC output, improves process safety and the resin quality.

Nouryon also offers various **secondary suspending agents**, which are used to control PVC porosity. This includes solvent-based products and aqueous

emulsions. Brand names are Active, DCloud and Ethapol. A specific Ethapol (MPG) is used as anti-foaming agent.

Moreover, Nouryon is a global leader in **antifouling agents**, branded Noxol and Everplus, which are used to prevent the reactor fouling and polymer buildup in the polymerization process.

Nouryon has a strategic focus on the PVC industry, having global production assets and a dedicated R&D laboratory. Technical support is provided by a technical staff having significant PVC technology experience and know-how.

## Polymerization initiators for PVC

Organic peroxides are used as single initiator or in a combination of initiators to optimize the polymerization rate. The most important criteria for selecting the right initiator are peroxide reactivity, physical form and regulatory status. Most solid and liquid peroxides also are available as water-based suspensions and emulsions with improved safety characteristics.

Food contact approved water-based peroxide suspensions and emulsions have been developed by Nouryon to serve the European PVC industry,

whereas new methanol-free peroxide emulsions have been developed to serve the US PVC industry. Such water-based peroxide formulations are intrinsically safer than solvent based ones.

Organic peroxide suspensions and emulsions are supplied in HDPE cans or in stainless steel and composite IBCs. Bulk transport of peroxide emulsions is carried out by a temperature controlled manifold trailer equipped with multiple stainless-steel IBCs allowing direct transfer to a (refrigerated) storage tank



PRODUCT NAME*	CHEMICAL NAME	PHYSICAL FORM	ASSAY (%)	ACTIVE OXYGEN (%)	TS MIN (°C)	TS MAX (°C)	T (°C) FORT ½ = 1.0 H	SADT (°C)	PACKAGE
TRIGONOX 187-W40	Diisobutyl peroxide	Emulsion in water and methanol	40	3.68	-30	-25	39	0	HDPE can, IBC
TRIGONOX 193-C75	3-hydroxy-1,1-dimethylbutyl peroxyneodecanoate	Solution in odourless mineral spirits	75	4.16		-20	51	10	HDPE bottle
TRIGONOX 99-C75	Cumyl peroxyneodecanoate	Solution in odourless mineral spirits	75	3.92		-20	56	10	HDPE can
TRIGONOX 99-W(E)50		Emulsion in water and (m) ethanol	50	2.61	-25	-20	56	5	IBC
TRIGONOX 423-C70	1,1,3,3-Tetramethylbutyl peroxyneodecanoate	Solution in odourless mineral spirits	70	3.73		-15	57	15	HDPE can
TRIGONOX 423-W50		Emulsion in water and methanol	50	2.66	-20	-15	57	15	HDPE can, IBC
TRIGONOX 123-C75	tert-Amyl peroxyneodecanoate	Solution in odourless mineral spirits	75	4.64	-25	-15	61	20	HDPE can
TRIGONOX SBP(S)	Di-sec-butyl peroxydicarbonate	Liquid	98	6.69		-20	63	0	HDPE bottle
TRIGONOX SBP(S)-C60		Solution in odourless mineral spirits	60	4.10		-20	63	0	HDPE bottle
PERKADOX 16(S)	Di(4-tert-butylcyclohexyl) peroxydicarbonate	Powder	96	3.83		20	64	40	Carton
PERKADOX 16-W25-GB1		Suspension in water	25	1.00	0	20	64	40	HDPE can, IBC
TRIGONOX EHPS	Di(2-ethylhexyl) peroxydicarbonate	Liquid	98	4.53		-20	64	0	HDPE can
TRIGONOX EHP(S)-C75		Solution in odourless mineral spirits	75	3.46	-25	-15	64	5	HDPE can
TRIGONOX EHP-W(E)60		Emulsion in water and (m) ethanol	60	2.77	-25	-15	64	5	HDPE can
	60		2.77	-25	-20	64	0	IBC	
TRIGONOX 23	tert-Butyl peroxyneodecanoate	Liquid	95	6.22	-30	-10	64	15	HDPE can
TRIGONOX 23-C75		Solution in odourless mineral spirits	75	4.91	-20	-10	64	20	HDPE can
TRIGONOX 23-W(E)50		Emulsion in water and (m) ethanol	50	3.27	-25	-10	64	15	HDPE can, IBC
PERKADOX 24-FL	Dicetyl peroxydicarbonate	Flakes	94.5	2.65		20	65	40	Carton
PERKADOX 24L		Powder	91	2.55		20	65	40	Carton
PERKADOX 24-W35		Suspension in water	35	0.98	0	15	65	40	HDPE can
PERKADOX 26	Dimyristyl peroxydicarbonate	Flakes	96	2.98		15	65	35	Carton
TRIGONOX 425-C75	1,1,3,3-Tetramethylbutyl peroxyipivalate	Solution in odourless mineral spirits	75	5.21	-25	-15	66	20	HDPE can
TRIGONOX 125-C75	tert-Amyl peroxyipivalate	Solution in odourless mineral spirits	75	6.37	-30	-10	72	25	HDPE can
TRIGONOX 125-W40		Emulsion in water and methanol	40	3.40	-25	-10	72	25	HDPE can
TRIGONOX 25-C75	tert-Butyl peroxyipivalate	Solution in odourless mineral spirits	75	6.89	-15	-5	75	20	HDPE can
TRIGONOX 36-C75	Di(3,5,5-trimethylhexanoyl) peroxide	Solution in odourless mineral spirits	75	3.82	-10	0	77	20	HDPE can
TRIGONOX 36-W50		Emulsion in water and methanol	50	2.54	-22	0	77	25	HDPE can, IBC
LAUROX	Dilauroyl peroxide	Flakes	99	3.97		30	79	50	Carton
LAUROX W40 (-GD4)		Suspension in water	40	1.61	0	20	79	50	HDPE can, IBC

(\* Listed are the highest concentrations of formulations available; lower concentrations may also be available – depending on region)

## Continuous Initiator Dosing

Continuous Initiator Dosing (CiD) is a revolutionary concept which increases PVC production capacity by 20-40% while making the PVC process intrinsically safer. In addition to improving PVC quality and consistency, CiD helps to reduce costs. CiD has already been implemented successfully at several production locations around the world.

In traditional PVC production the reactor is loaded with the raw material VCM monomer and water in the first step of the process. Then the total amount of organic peroxides needed for the polymerization is added. The temperature is increased, and the peroxides initiate the polymerization reaction.

During the reaction, a lot of heat is produced, and the capacity of the reactor is determined by the maximum cooling capacity.

With CiD, the heat production in the reactor is controlled by the quantity of peroxide dosed throughout the polymerization process. To achieve this, a control valve is installed and a special fast peroxide, **Trigonox 187**, is used. As a result, the cooling capacity is optimized, and the batch time is reduced, increasing the overall capacity. The reaction can be stopped and restarted at any time by simply interrupting or restarting the peroxide dosing.

During the polymerization process a minimum peroxide level is present at any time ensuring intrinsic process safety.

Nouryon provides licenses for the use of the patented CiD technology and supports production test runs with mobile initiator dosing units.





## Secondary suspending agents

Nouryon offers a wide range of polyvinyl alcohol (PVA) secondary suspending agents, which are used to control PVC porosity and to improve drying and stripping. This includes solvent based products and aqueous emulsions.

The Active 45/Ethapol 55 range contains solvents. The DCloud and Ethapol water-based suspending agents can be charged to a hot PVC reactor. In combination with organic peroxide emulsions they provide excellent PVC characteristics and reduced 'fish eye' levels. In addition, water-based suspending agents are environmentally friendly due to the absence of an organic solvent. Ethapol MPG is a secondary PVA, which also has excellent antifoaming properties. Antifoaming agents are essential for optimal performance of a PVC reactor preventing foaming in both the reactor and PVC stripping sections.

Our suspending agents can be supplied in drums, intermediate bulk containers (IBC's), bulk truck containers (BTC's) and bulk ISO containers (BIC's).

PRODUCT NAME CHEMICAL NAME (CAS NR.)	PHYSICAL FORM	MAIN APPLICATIONS				
		SOLID CONTENT (%)	DoH*	S-PVC	COPOLYMERS (VCM/VAM)	E-PVC
<b>SOLVENT-BASED</b>						
Polyvinyl acetate partially hydrolyzed [25213-24-5]						
ACTIVE 45	solution in ethanol and ethyl acetate	40	45	•	•	•
ETHAPOL 55	solution in water and ethanol	40	58.5	•	•	•
<b>WATER-BASED</b>						
Polyvinyl acetate partially hydrolyzed [25213-24-5]						
DCLOUD 35	emulsion in water	40	36	•	•	•
DCLOUD 45	emulsion in water	35	46	•	•	•
ETHAPOL MPG	emulsion in water	28	70.5	•	•	•

\* DoH = Degree of hydrolysis



## Antifouling agents

Nouryon is the world's number one supplier of antifouling agents, branded Noxol and Everplus. The products are applied with high pressure steam for coating of the reactor wall or internal parts such as stirrer, baffles, reflux condenser or cooling coils. This coating prevents unwanted PVC formation and deposits.

The Noxol brand is recognized as the worldwide market leader in antifouling. It provides better adhesion to the reactor wall, while its functional groups protect against negative interaction with oxygen. Noxol is known for its light color and transparency, which are the clearest visual distinctions from all other antifouling agents available in the market.

PRODUCT NAME CHEMICAL NAME (CAS NR.)	PHYSICAL FORM	MAIN APPLICATIONS				
		SOLID CONTENT (%)	S-PVC	COPOLYMERS (VCM/VAM)	E-PVC	MASS PVC
NOXOL ETH	solution in water and ethanol	20	•	•	•	
NOXOL ETH/S3	solution in water and ethanol	10	•		•	
NOXOL WSW	solution in water	5.5	•	•	•	
NOXOL WSW/D7	solution in water	7	•	•	•	
NOXOL WSW/D9	solution in water	9	•	•	•	
EVERPLUS	solution in water	5.5	•	•	•	•

The antifouling agents can be supplied in bottles, drums and intermediate bulk containers (IBC's). The products are kept under nitrogen atmosphere protecting against oxidation.



# Contact us

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

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## Additional information

Product Data Sheets (PDS) and Safety Data Sheets (SDS) for our polymerization initiators are available at [polymerchemistry.nouryon.com](http://polymerchemistry.nouryon.com)

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