

Organic Peroxides
General Catalog



Call toll free 1-800-558-5575 • Fax: 215-419-7413 • Website www.Luperox.com



Meeting Your Needs for Organic Peroxides

The Organic Peroxides unit of ATOFINA Chemicals, Inc. is the industry leader offering the most complete line of high quality organic peroxides worldwide.

MEETING YOUR NEEDS WORLDWIDE

With manufacturing facilities in New York, Texas and Mexico, warehousing in Canada and a broad distributor network, we are well established to handle your organic peroxide needs in North America. We are also positioned globally with several manufacturing facilities (see back page) to handle your peroxide needs worldwide.

ORGANIC PEROXIDE SELECTION

Commercially available peroxides from seven different structural groups provide a broad range of reactivity. Polymerization initiators from very fast hydroxy peresters, for rapid kinetics in vinyl polymerization, through high temperature dialkyl and hydroperoxides used as finishing catalysts are available. Crosslinking reactions are possible in polyethylene and elastomers using dialkyl peroxides and peroxyketals. By making use of promotion systems in polyester resins, peroxyesters can be used at significantly lower temperatures than would be predicted and ketone peroxides can be used at room temperature. Part I contains descriptions and suggested applications for these products.

Our commercially available peroxides are described by structural group in the tables in Part I. Column headings include the chemical name as well as trade names for each product, typical applications for which these products are suited, an indication of the product's reactivity as percent active oxygen by weight, temperatures for ten and one hour half-life* values and a brief description of the product.

In order to produce our extensive product line, we have developed expertise in several synthetic technologies. Examples of our capabilities include the following:

- Esterification
- Acylation
- Alkylation
- Free Radical Reactions
- Polymerization Reactions
- Reactive Processing

MEETING YOUR NEEDS WITH MORE TECHNICAL INFORMATION

Additional technical information for commercially available organic peroxides is available. There are bulletins for each peroxide group, detailing specifications, physical properties and safety data. In addition, applications bulletins, safety and handling bulletins, and analytical procedures can be provided.

Further technical assistance may be obtained by contacting our Marketing Department.

It must be remembered that organic peroxides may become dangerously unstable if handled improperly. For more detailed information concerning characteristics and proper safety precautions, consult our consolidated product bulletins and request pertinent safety literature from our Marketing Department or visit our website at www.Luperox.com.

QUALITY...THE FINAL WORD

We define quality as meeting your exact requirements with: a more consistent product; a better selection of products; more dependable delivery; and better performance in meeting your needs.

We maintain our extensive line of products to provide you with the choice and flexibility you want, and we provide specialized customer service as well. We deliver quality with:

- unequaled experience and technical know-how;
- ready availability and consistency of product around the world;
- leading technology and manufacturing capabilities;
- organic peroxide experts offering the best technical service in the industry;
- the largest research and development facilities in the United States;
- the development of products that are compatible with the environment;
- the industry's most comprehensive safe handling and storage programs;
- and ISO-9000 driven total quality programs.

At ATOFINA Organic Peroxides, everything we do is aimed at a singular goal...meeting your needs for organic peroxides.

At ATOFINA, quality is doing it right the first time every time. It is an attitude that can be found in everything we do — from research & development and manufacturing to marketing, sales and order entry, to packaging and distribution.

We're working harder at it every day. And it's paying off. We're recognized by DuPont Ethylene Copolymers as "...the first company to meet stringent quality criteria."

Ultimately, our measure of quality is your complete satisfaction. That is our commitment.

* Half-life is defined as the time it takes for one half of a given quantity of peroxide in dilute solution to decompose at a given temperature. The decomposition rate is first order and is characterized by the following equation where C = Peroxide concentration, t = Time and k = Rate Constant.

$$\frac{-dC}{dt} = kC$$

For convenience in comparing the stability of peroxides in dilute solutions, peroxides are commonly listed according to the temperatures at which they have half-lives of 10 hrs. The higher the temperature corresponding to the 10 hr. half-life, the more stable the peroxide.

PART I PEROXIDES

Group 1 DIACYL PEROXIDES													
General Formula	Chemical Name (CAS Registry)	New Trade Name (Old Name)	TYPICAL APPLICATIONS							HALF LIFE DATA		Description	
			Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic: Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C		% Active Oxygen (by weight)
$\begin{array}{c} \text{O} \quad \text{O} \\ \parallel \quad \parallel \\ \text{R-C-OO-C-R} \end{array}$	Decanoyl Peroxide (762-12-9)	Luperox DEC*	•			•	•			65	83	4.60 min.	Flaked Solid (98.5%)
	Lauroyl Peroxide (105-74-8)	Luperox LP	•					•		64	81	3.95 min.	Flaked Solid (98.5%)
	Succinic Acid Peroxide (123-23-9)	Luperox SAP*	•	•						66	90	3.96-4.85	Frozen, Wet Solid (58-71%)
	Benzoyl Peroxide (94-36-0)	Luperox A98	•		•	•	•	•	•	73	92	6.47 min.	98% Granular Solid
		Luperox A75	•				•	•		73	92	4.82-5.09	75% Granular Wet Solid
		Luperox A70S	•				•	•		73	92	4.00-4.76	70% Granular Wet Solid, USP Grade
		Luperox A75FP	•				•	•		73	92	4.82-5.09	75% Fine Particle Granular Solid, USP Grade
		Luperox AFR40					•	•				2.64-2.77	40% Pourable Paste
		Luperox ANS55					•	•	•			3.63-3.83	55% Paste with Plasticizer
		Luperox ANS55P					•	•	•			3.63-3.83	55% Paste with Plasticizer
Luperox ATC50				•		•	•	•			3.30-3.43	50% Paste with Tricresyl Phosphate	
Luperox ACP35					•	•				2.31-2.44	35% Powder, Blend with Inorganic Phosphates		
*Requires Refrigerated Shipment and Storage													

Group 2 KETONE PEROXIDES

General Formula	Chemical Name (CAS Registry)	Trade Name	TYPICAL APPLICATIONS							HALF LIFE DATA		% Active Oxygen (by weight)	Description		
			Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C				
	Mixture of Peroxides and Hydroperoxides (1338-23-4)	Luperox DDM-9								•	NA	NA	8.7-9.0	Plasticizer Solutions	
		Luperox DDM-30								•	NA	NA	5.50-6.05		
		Luperox DHD-9									•	NA	NA		8.7-9.0
		Luperox DSW-9									•	NA	NA		8.7-9.0
		Luperox DeltaX-9									•	NA	NA		8.7-9.0
	2, 4-Pentanedione Peroxide (37187-22-7)	Luperox 224										NA	NA	4.00-4.15	Proprietary F.R. Formulations

Group 3 PEROXYDICARBONATES

	Di(n-Propyl) Peroxydicarbonate (16066-38-9)	Luperox 221*	•								50	66	7.68 min.	99% Liquid	
	Di(sec-Butyl) Peroxydicarbonate (19910-65-7)	Luperox 225-M60*	•									51	69	4.03-4.17	60% Solution in OMS
		Luperox 225S*	•									51	69	6.73 min.	98.5% Stabilized Liquid
	Di(2-ethylhexyl) Peroxydicarbonate (16111-62-9)	Luperox 223-M75S*	•									49	66	3.46-3.56 in OMS	75% Solution
		Luperox 223S*	•									49	66	4.52 min	97% Stabilized Liquid

*Requires Refrigerated Shipment and Storage
NA-Not Applicable

**Group 4
PEROXYESTERS**
TYPICAL APPLICATIONS
**HALF LIFE
DATA**

General Formula	Chemical Name (CAS Registry)	New Trade Name (Old Name)	Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C	% Active Oxygen (by weight)	Description
R-OOC-R' 	1,1-Dimethyl-3-hydroxybutyl Peroxyneodecanoate (95718-78-8)	Luperox 610M75	•	•					•	37	54	4.10-4.22	75% Solution in OMS
R-OOC-OR' 	α-Cumyl Peroxyneodecanoate (26748-47-0)	Luperox 188M75*	•							38	56	3.86-3.97	75% Solution in OMS
$[\text{R-OO-C-R}]_2$ 	α-Cumyl Peroxyneohexanoate (104852-44-0)	Luperox 288M75*	•							43	60	4.48-4.60	75% Solution in OMS
	t-Amyl Peroxyneodecanoate (68299-16-1)	Luperox 546M75*	•						•	46	64	4.58-4.71	75% Solution in OMS
	t-Butyl Peroxyneodecanoate (26748-41-4)	Luperox 10M75* Luperox 10*	• •				•		•	48 48	66 66	4.85-4.98 6.22 min.	75% Solution in OMS 95% Liquid
	t-Amyl Peroxypivalate (29240-17-3)	Luperox 554M75*	•						•	55	74	6.29-6.46	75% Solution in OMS
	t-Butyl Peroxypivalate (927-07-1)	Luperox 11M75*	•						•	58	76	6.80-6.98	75% Solution in OMS
	2, 5-Dimethyl 2, 5-di (2-ethylhexanoyl peroxy) hexane (13052-09-0)	Luperox 256*	•				•		•	73	91	6.7 min.	90% Liquid
	t-Amyl Peroxy-2-ethyl-hexanoate (686-31-7)	Luperox 575* Luperox 575M75*	• •				•		•	75 75	92 92	6.60 min. 5.14-5.28	95% Liquid 75% Solution in O.M.S.
	t-Butyl Peroxy-2-ethylhexanoate (3006-82-4)	Luperox 26* Luperox 26M50* Luperox 26P50*	• • •				•		•	77 77 77	95 95 95	7.18 min. 3.70 min. 3.70-3.99	97% Liquid 50% Solution in OMS 50% Solution in Dioctyl-Phthalate
	t-Amyl Peroxyacetate (690-83-5)	Luperox 555M60	•				•		•	100	120	6.35-6.78	60% Solution in OMS
	t-Butyl Peroxyacetate (107-71-1)	Luperox 7M75 Luperox 7M50	• •				•		•	102 102	123 123	8.96-9.20 5.93-6.18	75% Solution in OMS 50% Solution in OMS
	t-Amyl Perbenzoate (4511-39-1)	Luperox TAP	•	•			•		•	100	122	7.3 min.	95% Liquid
	t-Butyl Perbenzoate (614-45-9)	Luperox P Luperox PXL	• •	•		•	•	•	•	104 104	125 125	8.07 min. 4.08-4.24	98% Liquid 50% Solid on Inert Filler

*Requires Refrigerated Shipment and Storage.

**Group 4
PEROXYESTERS (continued)**

TYPICAL APPLICATIONS

**HALF LIFE
DATA**

General Formula	Chemical (CAS Registry)	New Trade Name (Old Name)	Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C	% Active Oxygen (by weight)	Description
$R-OOC-R'$	OO-t-Amyl-O (2-ethylhexyl) monoperoxycarbonate (70833-40-8)	Luperox TAEC	•				•		•	99	117	5.8-6.0	92% Liquid
$R-OOC-OR'$	OO-t-Butyl O-isopropyl Monoperoxycarbonate (2372-21-6)	Luperox TBIC-M75	•	•		•	•		•	99	118	6.72-6.90	75% Solution in OMS
$[R-C(OOR')]_2$	OO-t-Butyl 1-(2-ethylhexyl) Monoperoxycarbonate (34443-12-4)	Luperox TBEC	•	•		•	•		•	100	121	6.17-6.37	95% Liquid
$[R-OO-C-R']_2$	Proprietary Multifunctional Initiator	Luperox JWEB50	•				•		•	100	119	3.32-3.45	50% Solution in Ethylbenzene

*Requires Refrigerated Shipment and Storage. **Call an ATOFINA representative for shipping information.

**Group 5
DIALKYL PEROXIDES**

$(R-OO)_nR'$ n=1 or 2	Dicumyl Peroxide (80-43-3)	Luperox DC99	•		•	•	•			117	137	5.80-5.92	99% Free Flowing Powder	
		Luperox DCSC	•		•	•	•			117	137	5.80 min.	99% Flakes	
		Luperox DC40P			•	•	•				117	137	2.34-2.46	40% Solid on Inert Filler
		Luperox DC40KE			•	•	•				117	137	2.34-2.46	40% Solid on Inert Filler
		Luperox DC40KEP				•					117	137	2.34-2.46	40% Solid on Inert Filler
		Luperox DC40MG				•					117	137	2.34-2.46	40% Solid on Inert Filler
		Luperox HP-DKEP			•	•	•				117	137	2.13-2.31	38% Solid on Inert Filler with Scorch Additive

**Group 5
DIALKYL PEROXIDES (continued)**
TYPICAL APPLICATIONS
**HALF LIFE
DATA**

General Formula	Chemical Name (CAS Registry)	New Trade Name	TYPICAL APPLICATIONS							HALF LIFE DATA		% Active Oxygen (by weight)	Description
			Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C		
(R-OO) _n R' n=1 or 2	2, 5-Dimethyl-2, 5-di-(t-Butylperoxy) hexane (78-63-7)	Luperox 101	•		•	•	•		•	120	140	10.03-10.25	91-93% Liquid
		Luperox 101XL45			•	•	•			120	140	4.96-5.29	45% Solid on Inert Filler
		Luperox 101PP20			•					120	140	2.09-2.31%	20% dispersion on polypropylene carrier
	α-α'-bis (t-Butylperoxy) diisopropylbenzene (25155-25-3)	Luperox F				•	•	•		119	139	9.17 min.	97% Flakes
		Luperox F40KEP				•	•	•		119	139	3.74-3.93	40% on Inert Filler
		Luperox F40MG					•			119	139	3.74-3.93	40% on Inert Filler
		Luperox HP FKEP				•	•	•		119	139	3.41-3.69	32% on Inert Filler with Scorch Additive
		Luperox F90P		•			•			119	139	8.45%	89% White Powder
		Luperox F40P		•			•			119	139	3.74-3.93	40% Solid on Inert Filler
	Luperox 40		•			•			119	139	3.74-3.93	40% Granules	
	Di-t-Amyl Peroxide (10508-09-5)	Luperox DTA	•		•	•	•		•	123	143	8.81-9.00	96% Liquid
	Di-t-Butyl Peroxide (110-05-4)	Luperox DI	•		•	•	•		•	129	149	10.8 min.	98.5% Liquid
2, 5-Dimethyl-2, 5-di-(t-Butylperoxy) hexyne-3 (1068-27-5)	Luperox 130	•		•	•	•		•	131	152	10.05-10.61	90-95% Liquid	
	Luperox 130XL45			•	•	•		•	131	152	5.03-5.36	45% Solid on Inert Filler	

**Group 6
HYDROPEROXIDES**

R-OOH (H-OO-) ₂ R	Cumene Hydroperoxide (80-15-9)	Luperox CU90	•	•					•	158	190	9.25 min.	88% Liquid
	t-Butyl Hydroperoxide (75-91-2)	Luperox TBH70X	•	•						172	200	12.2 min.	70% Liquid with 30% Water

**Group 7
PEROXYKETALS**
TYPICAL APPLICATIONS
**HALF LIFE
DATA**

General Formula	Chemical Name (CAS Registry)	New Trade Name	Polymerization: Bulk, Solution, Suspension	Polymerization: Emulsion	Polymer Modification Thermoplastic Crosslinking	Curing Elastomers	Polyester Resins High Temp. Cure	Polyester Resins Room Temp. Cure	Cure of Acrylic Syrup	10 hr. T _{1/2} °C	1 hr. T _{1/2} °C	% Active Oxygen (by weight)	Description
$\begin{array}{c} \text{R} \quad \text{OOR}' \\ \diagdown \quad / \\ \text{C} \\ / \quad \diagdown \\ \text{R} \quad \text{OOR}' \end{array}$	1, 1-Di-(t-Butylperoxy)-3, 3, 5-trimethyl-cyclohexane (6731-36-8)	Luperox 231	•		•	•	•		•	96	115	9.73 min.	Colorless Liquid (92%)
		Luperox 231XL40			•	•	•			96	115	4.13-4.34	40% Solid on Inert Filler
		Luperox 231P75						•		96	115	7.83-8.04	75% Solution in Dibutyl Phthalate
	1, 1-Di-(t-Butylperoxy)-cyclohexane (3006-86-8)	Luperox 331M80	•				•		•	97	116	9.70-9.95	80% Solution in OMS
	1, 1-Di-(t-Amylperoxy)-cyclohexane (15667-10-4)	Luperox 531M80	•						•	93	112	8.77-8.99	80% Liquid in OMS
	n-Butyl 4,4-bis(t-Butylperoxy) valerate	Luperox 230XL			•	•				109	129		40% Solid on Inert Filler
	Ethyl 3, 3-Di-(t-Amylperoxy)-butyrate (67567-23-1)	Luperox 533M75	•		•				•	112	132	7.39-7.59	75% Solution in OMS
	Blend 1,1-Di-(t-Butylperoxy)-cyclohexane, 40% (3006-86-8) & tert-Butyl Peroctoate, 25% (3006-82-4)	Luperox M33 [*]	•					•	•	N/A	N/A	6.70-6.97	Liquid Solution
	Ethyl-3, 3-Di-(t-Butylperoxy)-butyrate (55794-20-2)	Luperox 233M75	•					•	•	114	134	8.21-8.42	75% Solution in OMS

*Requires Refrigerated Shipment and Storage

Available Information

SAFETY LITERATURE

1. Organic Peroxides: Their Safe Handling and Use
2. Wall Chart for Methyl Ethyl Ketone Peroxides
3. SPI Toxicological Data

TECHNICAL LITERATURE

1. HALFLIFE® Bulletin, Peroxide Selection Based on Half-life
2. Indirect Food Additives Summary
3. Selection Guide for PVC
4. Better Performance in Suspension Polystyrene
5. Better Performance in Crystal Polystyrene
6. Crosslinking Half-Life Temperature Bulletin/Chart
7. Organic Peroxides for Rubber Crosslinking... Including New Peroxide Curing Systems
8. Chemical Curing of Elastomers and Crosslinking of Thermoplastics
9. Polypropylene Modification with Peroxides
10. Reprints — Select SPI technical presentations concerning free radical initiators.
11. Technical Service Bulletins — Published as needed to update product literature and provide specialized information.

LITERATURE PACKAGES

1. Crosslinking
2. Polyester/Elevated Temperature Curing for PET
3. Polyester/Room Temperature Curing for PET
4. PVC
5. Polystyrene
6. Acrylic
7. LDPE
8. Safety

SAFETY AND QUALITY VIDEOS

1. Keep it Cool, Keep it Clean — Considers hazards and preventative measures relative to MEK peroxide use in unsaturated polyester applications.
2. Organic Peroxides – Handle with Care — Discusses peroxide safety relevant to the process industry, with emphasis on products requiring refrigerated storage and handling. Offers recommended practices.

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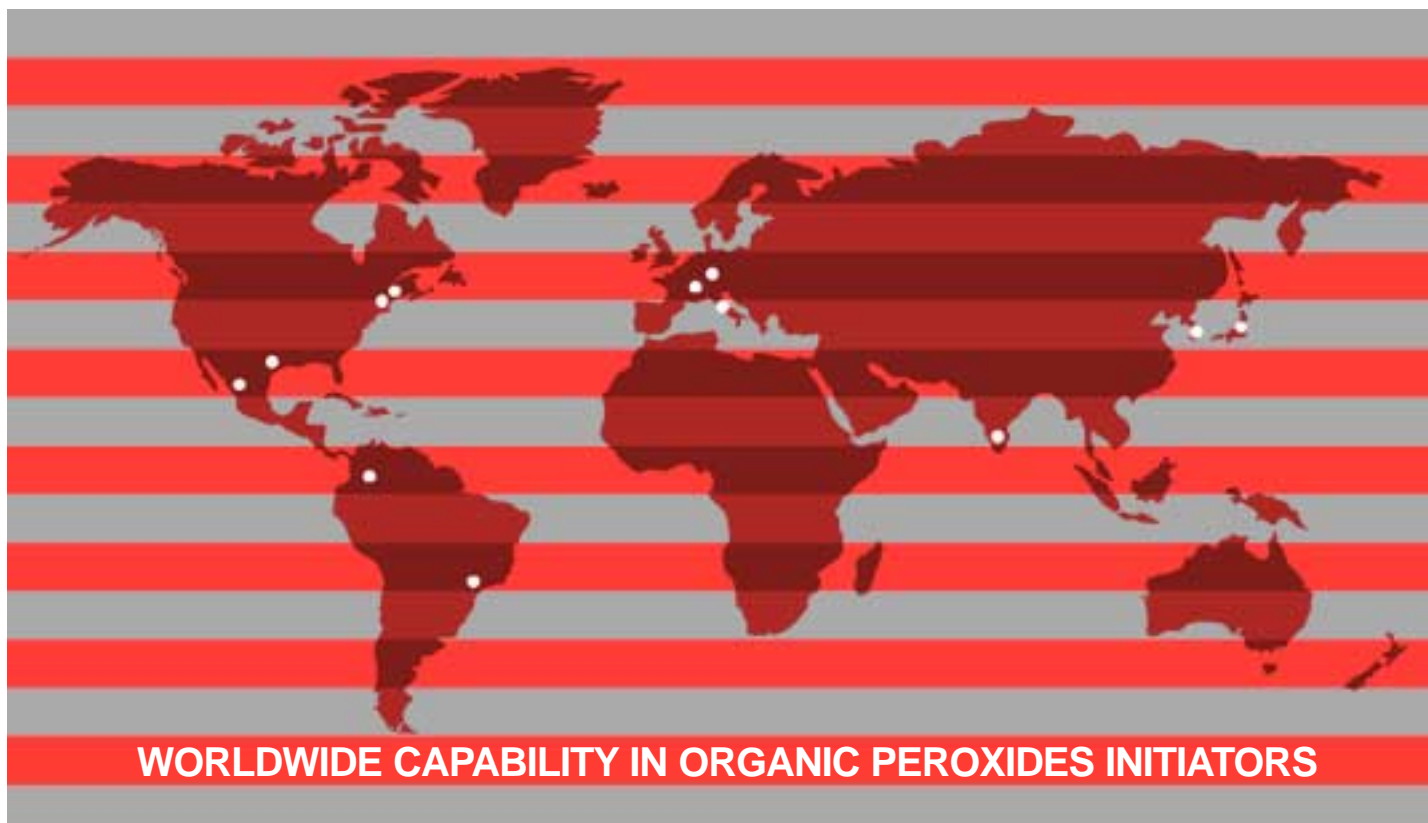
Call toll free

Literature

1-800-558-5575 or visit our website at www.Luperox.com

Material Safety Data Sheets

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Remember the Rules for Safety
Safe use of organic peroxide initiators

- Leave room for cool air circulation in storage.
- Rotate inventory: "first in, first out."
- Know your plant's emergency procedures.
- Take only what you will be using.
- Clean up spills. Dispose of them properly.
- Control the temperature of all equipment.
- Protect your eyes and skin.
- Read the label and material safety data sheet (MSDS) for every peroxide you use.
- Keep peroxide away from flames, sparks and heat.
- Avoid contamination.

These are the keys to safe handling of peroxides. When care is taken, the use of peroxides will be a problem-free and safe procedure.

EMERGENCY RESPONSE NUMBER

CHEMTREC 800-424-9300
 from Canada 202-483-7616

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