

**SAFETY DATA SHEET****Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version 6.1      Revision Date: 10/03/2017      SDS Number: 1335637-00036      Date of last issue: 09/11/2017  
Date of first issue: 02/27/2017

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**SECTION 1. IDENTIFICATION**

Product name : Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant  
SDS-Identcode : 130000043292

**Manufacturer or supplier's details**

Company name of supplier : The Chemours Canada Company  
Address : PO Box 118 Streetsville  
Streetsville ON L5M 2B7 Canada  
Telephone : 1-844-773-CHEM (2436)  
Emergency telephone : 1-866-595-1473 (24 hours)

**Recommended use of the chemical and restrictions on use**

Recommended use : Heat transfer fluids  
Refrigerant  
Formulation of preparations  
Restrictions on use : For professional and industrial installation and use only.

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**SECTION 2. HAZARDS IDENTIFICATION****GHS classification in accordance with the Hazardous Products Regulations**

Flammable gases : Category 1  
Gases under pressure : Liquefied gas  
Simple Asphyxiant : Category 1

**GHS label elements**

Hazard pictograms :

Signal Word : Danger  
Hazard Statements : H220 Extremely flammable gas.  
H280 Contains gas under pressure; may explode if heated.  
May displace oxygen and cause rapid suffocation.

Precautionary Statements : **Prevention:**  
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

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**SAFETY DATA SHEET**
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Version 6.1      Revision Date: 10/03/2017      SDS Number: 1335637-00036      Date of last issue: 09/11/2017  
 Date of first issue: 02/27/2017

**Response:**

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 In case of leakage, eliminate all ignition sources.

**Storage:**

P410 + P403 Protect from sunlight. Store in a well-ventilated place.

**Other hazards**

Misuse or intentional inhalation abuse may cause death without warning symptoms, due to cardiac effects.

Rapid evaporation of the product may cause frostbite.

Vapors are heavier than air and can cause suffocation by reducing oxygen available for breathing.

**SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS**

Substance / Mixture : Substance  
 Substance name : 2,3,3,3-Tetrafluoropropene  
 CAS-No. : 754-12-1

**Hazardous ingredients**

Chemical name	CAS-No.	Concentration (% w/w)
2,3,3,3-Tetrafluoropropene*	754-12-1	99.8

\* Voluntarily-disclosed non-hazardous substance

**SECTION 4. FIRST AID MEASURES**

General advice : In the case of accident or if you feel unwell, seek medical advice immediately.  
 When symptoms persist or in all cases of doubt seek medical advice.

If inhaled : If inhaled, remove to fresh air.  
 Get medical attention if symptoms occur.

In case of skin contact : Thaw frosted parts with lukewarm water. Do not rub affected area.  
 Get medical attention immediately.

In case of eye contact : Get medical attention immediately.

If swallowed : Ingestion is not considered a potential route of exposure.

Most important symptoms and effects, both acute and delayed : May cause cardiac arrhythmia.  
 Contact with liquid or refrigerated gas can cause cold burns and frostbite.  
 Other symptoms potentially related to misuse or inhalation abuse are

**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

Cardiac sensitization  
 Anaesthetic effects  
 Light-headedness  
 Dizziness  
 confusion  
 Lack of coordination  
 Drowsiness  
 Unconsciousness

Protection of first-aiders : No special precautions are necessary for first aid responders.

Notes to physician : Treat symptomatically and supportively.

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**SECTION 5. FIRE-FIGHTING MEASURES**

Suitable extinguishing media : Water spray  
 Alcohol-resistant foam  
 Carbon dioxide (CO<sub>2</sub>)  
 Dry chemical

Unsuitable extinguishing media : None known.

Specific hazards during fire fighting : Vapors may form flammable mixture with air  
 Exposure to combustion products may be a hazard to health.  
 If the temperature rises there is danger of the vessels bursting due to the high vapor pressure.

Hazardous combustion products : Hydrogen fluoride  
 Fluorine compounds  
 Carbon oxides

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.  
 Fight fire remotely due to the risk of explosion.  
 Use water spray to cool unopened containers.  
 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
 Remove undamaged containers from fire area if it is safe to do so.  
 Evacuate area.

Special protective equipment for fire-fighters : Wear self-contained breathing apparatus for firefighting if necessary.  
 Use personal protective equipment.

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**SECTION 6. ACCIDENTAL RELEASE MEASURES**

Personal precautions, protective equipment and emergency procedures : Evacuate personnel to safe areas.  
 Only trained personnel should re-enter the area.  
 Remove all sources of ignition.  
 Avoid skin contact with leaking liquid (danger of frostbite).

**SAFETY DATA SHEET**

# Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

- Ventilate the area.  
Follow safe handling advice and personal protective equipment recommendations.
- Environmental precautions : Prevent further leakage or spillage if safe to do so.  
Retain and dispose of contaminated wash water.
- Methods and materials for containment and cleaning up : Ventilate the area.  
Non-sparking tools should be used.  
Suppress (knock down) gases/vapors/mists with a water spray jet.  
Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases. You will need to determine which regulations are applicable.  
Sections 13 and 15 of this SDS provide information regarding certain local or national requirements.

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## SECTION 7. HANDLING AND STORAGE

- Technical measures : Use equipment rated for cylinder pressure. Use a backflow preventative device in piping. Close valve after each use and when empty.
- Local/Total ventilation : Use with local exhaust ventilation.  
Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential
- Advice on safe handling : Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point.  
Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.  
Use a pressure reducing regulator when connecting cylinder to lower pressure (<3000 psig) piping or systems.  
Never attempt to lift cylinder by its cap.  
Do not drag, slide or roll cylinders.  
Use a suitable hand truck for cylinder movement.
- Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment  
Keep container tightly closed.  
Wear cold insulating gloves/ face shield/ eye protection.  
Prevent backflow into the gas tank.  
Open the valves slowly to prevent pressure surges.  
Close valve after each use and when empty. Do NOT change or force fit connections.  
Prevent the intrusion of water into the gas tank.  
Keep away from heat and sources of ignition.  
Take precautionary measures against static discharges.  
Take care to prevent spills, waste and minimize release to the

**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

environment.

**Conditions for safe storage** : Cylinders should be stored upright and firmly secured to prevent falling or being knocked over.  
 Separate full containers from empty containers.  
 Do not store near combustible materials.  
 Avoid area where salt or other corrosive materials are present.  
 Keep in properly labeled containers.  
 Keep tightly closed.  
 Keep in a cool, well-ventilated place.  
 Keep away from direct sunlight.  
 Store in accordance with the particular national regulations.  
 Keep away from heat and sources of ignition.

**Materials to avoid** : Do not store with the following product types:  
 Self-reactive substances and mixtures  
 Organic peroxides  
 Oxidizing agents  
 Flammable liquids  
 Flammable solids  
 Pyrophoric liquids  
 Pyrophoric solids  
 Self-heating substances and mixtures  
 Substances and mixtures which in contact with water emit flammable gases  
 Explosives  
 Acutely toxic substances and mixtures  
 Substances and mixtures with chronic toxicity

**Recommended storage temperature** : < 52 °C

**Storage period** : > 10 y

**Further information on storage stability** : The product has an indefinite shelf life when stored properly.

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**SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION**
**Ingredients with workplace control parameters**

Contains no substances with occupational exposure limit values.

**Engineering measures** : Minimize workplace exposure concentrations.  
 Use only in an area equipped with explosion-proof exhaust ventilation if advised by assessment of the local exposure potential  
 Use with local exhaust ventilation.

**Personal protective equipment**

**Respiratory protection** : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates

**SAFETY DATA SHEET**

# Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

that exposures are within recommended exposure guidelines.

- |                             |   |                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Filter type                 | : | Organic gas and low boiling vapor type                                                                                                                                                                                                                                                                                                                                                      |
| Hand protection<br>Material | : | Low temperature resistant gloves                                                                                                                                                                                                                                                                                                                                                            |
| Remarks                     | : | Choose gloves to protect hands against chemicals depending on the concentration specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer. Wash hands before breaks and at the end of workday. Breakthrough time is not determined for the product. Change gloves often! |
| Eye protection              | : | Wear the following personal protective equipment:<br>Chemical resistant goggles must be worn.<br>Face-shield                                                                                                                                                                                                                                                                                |
| Skin and body protection    | : | Wear the following personal protective equipment:<br>Flame retardant antistatic protective clothing, unless assessment demonstrates that the risk of explosive atmospheres or flash fires is low                                                                                                                                                                                            |
| Protective measures         | : | Wear cold insulating gloves/ face shield/ eye protection.                                                                                                                                                                                                                                                                                                                                   |
| Hygiene measures            | : | Ensure that eye flushing systems and safety showers are located close to the working place.<br>When using do not eat, drink or smoke.<br>Wash contaminated clothing before re-use.                                                                                                                                                                                                          |

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## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

- |                                         |   |                    |
|-----------------------------------------|---|--------------------|
| Appearance                              | : | Liquefied gas      |
| Color                                   | : | colorless          |
| Odor                                    | : | slight, ether-like |
| Odor Threshold                          | : | No data available  |
| pH                                      | : | No data available  |
| Melting point/freezing point            | : | -152.2 °C          |
| Initial boiling point and boiling range | : | -29.4 °C           |
| Flash point                             | : | Not applicable     |
| Evaporation rate                        | : | Not applicable     |

**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

Flammability (solid, gas)	:	Flammable
Burning rate	:	15 mm/s
Self-ignition	:	The substance or mixture is not classified as pyrophoric.
Upper explosion limit / Upper flammability limit	:	Upper flammability limit 12.3 %(V) Method: ASTM E681
Lower explosion limit / Lower flammability limit	:	Lower flammability limit 6.2 %(V) Method: ASTM E681
Vapor pressure	:	5,800 hPa (20 °C)
Relative vapor density	:	4 (Air = 1.0)
Density	:	0.0048 g/cm <sup>3</sup> (20 °C) Vapor density
Solubility(ies) Water solubility	:	0.1982 g/l (24 °C)
Partition coefficient: n-octanol/water	:	log Pow: 2 (25 °C)
Autoignition temperature	:	405 °C
Decomposition temperature	:	No data available
Viscosity Viscosity, kinematic	:	Not applicable
Explosive properties	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.
Minimum ignition energy	:	5 - 10 J
Particle size	:	Not applicable

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**SECTION 10. STABILITY AND REACTIVITY**

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable if used as directed. Follow precautionary advice and avoid incompatible materials and conditions.
Possibility of hazardous reactions	:	Vapors may form flammable mixture with air Can react with strong oxidizing agents.

**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

Extremely flammable gas.

Conditions to avoid : Heat, flames and sparks.

Incompatible materials : Oxidizing agents

Hazardous decomposition products : No hazardous decomposition products are known.

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**SECTION 11. TOXICOLOGICAL INFORMATION**
**Information on likely routes of exposure**

Inhalation  
Skin contact  
Eye contact

**Acute toxicity**

Not classified based on available information.

**Ingredients:**
**2,3,3,3-Tetrafluoropropene:**

Acute inhalation toxicity : LC50 (Rat): > 405000 ppm  
Exposure time: 4 h  
Test atmosphere: gas

Lowest observed adverse effect concentration (Dog): > 120000 ppm

Test atmosphere: gas  
Symptoms: Cardiac sensitization

No observed adverse effect concentration (Dog): 120000 ppm

Test atmosphere: gas  
Symptoms: Cardiac sensitization

Cardiac sensitisation threshold limit (Dog): > 559,509 mg/m<sup>3</sup>

Test atmosphere: gas  
Symptoms: Cardiac sensitization

**Skin corrosion/irritation**

Not classified based on available information.

**Ingredients:**
**2,3,3,3-Tetrafluoropropene:**

Species: Not tested on animals  
Result: No skin irritation

**Serious eye damage/eye irritation**

Not classified based on available information.

**SAFETY DATA SHEET****Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Species: Not tested on animals  
Result: No eye irritation

**Respiratory or skin sensitization****Skin sensitization**

Not classified based on available information.

**Respiratory sensitization**

Not classified based on available information.

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Routes of exposure: Skin contact  
Species: Not tested on animals  
Result: negative

**Germ cell mutagenicity**

Not classified based on available information.

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Germ cell mutagenicity - Assessment : Weight of evidence does not support classification as a germ cell mutagen.

**Carcinogenicity**

Not classified based on available information.

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Carcinogenicity - Assessment : Weight of evidence does not support classification as a carcinogen

**Reproductive toxicity**

Not classified based on available information.

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Reproductive toxicity - Assessment : Weight of evidence does not support classification for reproductive toxicity

**STOT-single exposure**

Not classified based on available information.

**SAFETY DATA SHEET****Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version 6.1      Revision Date: 10/03/2017      SDS Number: 1335637-00036      Date of last issue: 09/11/2017  
Date of first issue: 02/27/2017

---

**STOT-repeated exposure**

Not classified based on available information.

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Assessment: No significant health effects observed in animals at concentrations of 250 ppmV/6h/d or less.

**Repeated dose toxicity****Ingredients:****2,3,3,3-Tetrafluoropropene:**

Species: Rat  
NOAEL: 50000 ppm  
LOAEL: >50000 ppm  
Application Route: inhalation (gas)  
Exposure time: 90 d  
Method: OECD Test Guideline 413  
Remarks: No significant adverse effects were reported

**Aspiration toxicity**

Not classified based on available information.

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**SECTION 12. ECOLOGICAL INFORMATION****Ecotoxicity****Ingredients:****2,3,3,3-Tetrafluoropropene:**

Toxicity to fish : LC50 (Cyprinus carpio (Carp)): > 197 mg/l  
Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (Water flea)): > 100 mg/l  
Exposure time: 48 h

Toxicity to algae : NOEC (algae): > 100 mg/l  
Exposure time: 72 h

**Persistence and degradability****Product:**

Biodegradability : Test Type: aerobic  
Biodegradation: < 5 %  
Exposure time: 28 d  
Method: OECD Test Guideline 301F  
Remarks: According to the results of tests of biodegradability this product is not readily biodegradable.

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**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Biodegradability : Result: Not readily biodegradable.  
Method: OECD Test Guideline 301F

**Bioaccumulative potential****Product:**

Bioaccumulation : Remarks: No bioaccumulation is to be expected (log Pow <= 4).

**Ingredients:****2,3,3,3-Tetrafluoropropene:**

Bioaccumulation : Remarks: No bioaccumulation is to be expected (log Pow <= 4).

**Mobility in soil**

No data available

**Other adverse effects****Product:**

Results of PBT and vPvB assessment : This substance is not considered to be persistent, bioaccumulating and toxic (PBT).

This substance is not considered to be very persistent and very bioaccumulating (vPvB).

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**SECTION 13. DISPOSAL CONSIDERATIONS**
**Disposal methods**

Waste from residues : Dispose of in accordance with local regulations.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal.  
Empty pressure vessels should be returned to the supplier.  
If not otherwise specified: Dispose of as unused product.

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**SECTION 14. TRANSPORT INFORMATION**
**International Regulations****UNRTDG**

UN number	:	UN 3161
Proper shipping name	:	LIQUEFIED GAS, FLAMMABLE, N.O.S. (2,3,3,3-Tetrafluoropropene)
Class	:	2.1

**SAFETY DATA SHEET**
**Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

Packing group : Not assigned by regulation  
 Labels : 2.1

**IATA-DGR**

UN/ID No. : UN 3161  
 Proper shipping name : Liquefied gas, flammable, n.o.s.  
 (2,3,3,3-Tetrafluoropropene)  
 Class : 2.1  
 Packing group : Not assigned by regulation  
 Labels : Flammable Gas  
 Packing instruction (cargo aircraft) : 200  
 Packing instruction (passenger aircraft) : Not permitted for transport

**IMDG-Code**

UN number : UN 3161  
 Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
 (2,3,3,3-Tetrafluoropropene)  
 Class : 2.1  
 Packing group : Not assigned by regulation  
 Labels : 2.1  
 EmS Code : F-D, S-U  
 Marine pollutant : no

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**

Not applicable for product as supplied.

**Domestic regulation****TDG**

UN number : UN 3161  
 Proper shipping name : LIQUEFIED GAS, FLAMMABLE, N.O.S.  
 (2,3,3,3-Tetrafluoropropene)  
 Class : 2.1  
 Packing group : Not assigned by regulation  
 Labels : 2.1  
 ERG Code : 115  
 Marine pollutant : no

**SECTION 15. REGULATORY INFORMATION****SECTION 16. OTHER INFORMATION**

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Chemours™ and the Chemours Logo are trademarks of The Chemours Company.

Before use read Chemours safety information.

For further information contact the local Chemours office or nominated distributors.

**Full text of other abbreviations**

**SAFETY DATA SHEET****Opteon™ YF (HFO-1234yf, R-1234yf) Refrigerant**

Version	Revision Date:	SDS Number:	Date of last issue: 09/11/2017
6.1	10/03/2017	1335637-00036	Date of first issue: 02/27/2017

---

AICS - Australian Inventory of Chemical Substances; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Sources of key data used to compile the Material Safety Data Sheet : Internal technical data, data from raw material SDSs, OECD eChem Portal search results and European Chemicals Agency, <http://echa.europa.eu/>

Revision Date : 10/03/2017

Items where changes have been made to the previous version are highlighted in the body of this document by two vertical lines.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific material identified at the top of this SDS and may not be valid when the SDS material is used in combination with any other materials or in any process, unless specified in the text. Material users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS material in the user's end product, if applicable.

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