

## Halofuginone Formulation

Version	Revision Date:	SDS Number:	Date of last issue: 08.12.2023
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## SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Halofuginone Formulation  
Other means of identification : HALOCUR (A009802)  
HALOCUR ORAL SOLUTION FOR TREATMENT OF CALVES (57163)

**Manufacturer or supplier's details**

Company name of supplier : MSD  
Address : 126 E. Lincoln Avenue  
Rahway, New Jersey U.S.A. 07065  
Telephone : 908-740-4000  
Emergency telephone : 1-908-423-6000  
E-mail address : EHSDATASTEWARD@msd.com

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

Recommended use : Veterinary product  
Restrictions on use : Not applicable

## SECTION 2. HAZARDS IDENTIFICATION

**GHS Classification**

Skin corrosion/irritation : Category 2  
Serious eye damage/eye irritation : Category 2A

**GHS label elements**

Hazard pictograms :



Signal Word : Warning

Hazard Statements : H315 Causes skin irritation.  
H319 Causes serious eye irritation.

Precautionary Statements : **Prevention:**  
P264 Wash skin thoroughly after handling.  
P280 Wear protective gloves/ eye protection/ face protection.  
**Response:**  
P302 + P352 IF ON SKIN: Wash with plenty of water.  
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P332 + P313 If skin irritation occurs: Get medical advice/ attention.  
P337 + P313 If eye irritation persists: Get medical advice/ attention.  
P362 + P364 Take off contaminated clothing and wash it before

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reuse.

**Other hazards**

None known.

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

Substance / Mixture : Mixture

**Components**

Chemical name	CAS-No.	Concentration (% w/w)
Lactic acid	50-21-5	$\geq 1$ - $< 3$
Halofuginone	82186-71-8	$< 0.1$

**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	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
In case of eye contact	: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lens, if worn. Get medical attention.
If swallowed	: If swallowed, DO NOT induce vomiting. Get medical attention if symptoms occur. Rinse mouth thoroughly with water.
Most important symptoms and effects, both acute and delayed	: Causes skin irritation. Causes serious eye irritation.
Protection of first-aiders	: First Aid responders should pay attention to self-protection, and use the recommended personal protective equipment when the potential for exposure exists (see section 8).
Notes to physician	: Treat symptomatically and supportively.

**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	: Exposure to combustion products may be a hazard to health.

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fighting

Hazardous combustion products : Carbon oxides

Specific extinguishing methods : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.  
Use water spray to cool unopened containers.  
Remove undamaged containers from fire area if it is safe to do so.  
Evacuate area.

Special protective equipment for fire-fighters : In the event of fire, wear self-contained breathing apparatus.  
Use personal protective equipment.

**SECTION 6. ACCIDENTAL RELEASE MEASURES**

Personal precautions, protective equipment and emergency procedures : Use personal protective equipment.  
Follow safe handling advice (see section 7) and personal protective equipment recommendations (see section 8).

Environmental precautions : Avoid release to the environment.  
Prevent further leakage or spillage if safe to do so.  
Prevent spreading over a wide area (e.g., by containment or oil barriers).  
Retain and dispose of contaminated wash water.  
Local authorities should be advised if significant spillages cannot be contained.

Methods and materials for containment and cleaning up : Soak up with inert absorbent material.  
For large spills, provide diking or other appropriate containment to keep material from spreading. If diked material can be pumped, store recovered material in appropriate container.  
Clean up remaining materials from spill with suitable absorbent.  
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.

**SECTION 7. HANDLING AND STORAGE**

Technical measures : See Engineering measures under EXPOSURE CONTROLS/PERSONAL PROTECTION section.

Local/Total ventilation : Use only with adequate ventilation.

Advice on safe handling : Do not get on skin or clothing.  
Avoid inhalation of vapor or mist.  
Do not swallow.  
Do not get in eyes.

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- Wash skin thoroughly after handling.  
Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment  
Take care to prevent spills, waste and minimize release to the environment.
- Hygiene measures : If exposure to chemical is likely during typical use, provide eye flushing systems and safety showers close to the working place.  
When using do not eat, drink or smoke.  
Wash contaminated clothing before re-use.  
The effective operation of a facility should include review of engineering controls, proper personal protective equipment, appropriate degowning and decontamination procedures, industrial hygiene monitoring, medical surveillance and the use of administrative controls.
- Conditions for safe storage : Keep in properly labeled containers.  
Store in accordance with the particular national regulations.
- Materials to avoid : Do not store with the following product types:  
Strong oxidizing agents  
Gases

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

## Ingredients with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Halofuginone	82186-71-8	TWA	5 µg/m <sup>3</sup> (OEB 4)	Internal
Further information: DSEN, Skin				
		Wipe limit	50 µg/100 cm <sup>2</sup>	Internal

- Engineering measures : The information below is intended for larger pilot/commercial-scale operations and manufacturing. For smaller scale, clinical, or pharmacy settings, site-specific internal risk assessment practices should be conducted to determine appropriate exposure control measures. The health hazard risks of handling this material are dependent on multiple factors, including but not limited to physical form and quantity handled. If applicable, use process enclosures, local exhaust ventilation (e.g., Biosafety Cabinet, Ventilated Balance Enclosures), or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels as low as reasonably achievable.  
All engineering controls should be implemented by facility design and operated in accordance with GMP principles to protect products, workers, and the environment.  
Essentially no open handling permitted.  
Use closed processing systems or containment technologies. If handled in a laboratory, use a properly designed biosafety cabinet, fume hood, or other containment device if the

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potential exists for aerosolization. If this potential does not exist, handle over lined trays or benchtops.

**Personal protective equipment**

Respiratory protection	:	If adequate local exhaust ventilation is not available or exposure assessment demonstrates exposures outside the recommended guidelines, use respiratory protection.
Filter type	:	Organic vapor Type
Hand protection	:	
Material	:	Chemical-resistant gloves
Remarks	:	Consider double gloving.
Eye protection	:	Wear safety glasses with side shields or goggles. If the work environment or activity involves dusty conditions, mists or aerosols, wear the appropriate goggles. Wear a faceshield or other full face protection if there is a potential for direct contact to the face with dusts, mists, or aerosols.
Skin and body protection	:	Work uniform or laboratory coat. Additional body garments should be used based upon the task being performed (e.g., sleevelets, apron, gauntlets, disposable suits) to avoid exposed skin surfaces. Use appropriate degowning techniques to remove potentially contaminated clothing.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	:	liquid
Color	:	yellow
Odor	:	odorless
Odor Threshold	:	No data available
pH	:	2.1 - 3
Melting point/freezing point	:	No data available
Initial boiling point and boiling range	:	No data available
Flash point	:	No data available
Evaporation rate	:	No data available
Flammability (solid, gas)	:	Not applicable
Flammability (liquids)	:	No data available
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower	:	No data available

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flammability limit

Vapor pressure : No data available

Relative vapor density : No data available

Density : No data available

Solubility(ies)

Water solubility : No data available

Partition coefficient: n-octanol/water : No data available

Autoignition temperature : No data available

Decomposition temperature : No data available

Viscosity

Viscosity, kinematic : No data available

Explosive properties : Not explosive

Oxidizing properties : The substance or mixture is not classified as oxidizing.

Molecular weight : No data available

Particle characteristics

Particle size : No data available

## SECTION 10. STABILITY AND REACTIVITY

Reactivity : Not classified as a reactivity hazard.

Chemical stability : Stable under normal conditions.

Possibility of hazardous reactions : Can react with strong oxidizing agents.

Conditions to avoid : None known.

Incompatible materials : Oxidizing agents

Hazardous decomposition products : No hazardous decomposition products are known.

## SECTION 11. TOXICOLOGICAL INFORMATION

## Information on likely routes of exposure

Inhalation

Skin contact

Ingestion

Eye contact

## Acute toxicity

Not classified based on available information.

**Product:**

Acute oral toxicity : Acute toxicity estimate: &gt; 5,000 mg/kg

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Method: Calculation method

Acute inhalation toxicity : Acute toxicity estimate: > 10 mg/l  
Exposure time: 4 h  
Test atmosphere: dust/mist  
Method: Calculation method

**Components:****Lactic acid:**

Acute oral toxicity	: LD50 (Rat): > 2,000 mg/kg Remarks: Based on data from similar materials
Acute inhalation toxicity	: LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist Method: OECD Test Guideline 403 Assessment: Corrosive to the respiratory tract. Remarks: Based on data from similar materials
Acute dermal toxicity	: LD50 (Rabbit): > 2,000 mg/kg Assessment: The substance or mixture has no acute dermal toxicity Remarks: Based on data from similar materials

**Halofuginone:**

Acute oral toxicity	: LD50 (Rat): 30 mg/kg LD50 (Mouse): 5 mg/kg
Acute inhalation toxicity	: LC50 (Rat): 0.053 mg/l Test atmosphere: dust/mist
Acute dermal toxicity	: LD50 (Rabbit): 16 mg/kg

**Skin corrosion/irritation**

Causes skin irritation.

**Components:****Lactic acid:**

Species	: Rabbit
Method	: OECD Test Guideline 404
Result	: Corrosive after 1 to 4 hours of exposure
Remarks	: Based on data from similar materials

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Species	: Rabbit
Result	: Skin irritation

**Serious eye damage/eye irritation**

Causes serious eye irritation.

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**Components:****Lactic acid:**

Species	: Chicken eye
Remarks	: Based on data from similar materials
Result	: Irreversible effects on the eye

**Halofuginone:**

Result	: Severe irritation
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**Respiratory or skin sensitization****Skin sensitization**

Not classified based on available information.

**Respiratory sensitization**

Not classified based on available information.

**Components:****Lactic acid:**

Test Type	: Buehler Test
Routes of exposure	: Skin contact
Species	: Guinea pig
Result	: negative
Remarks	: Based on data from similar materials

**Halofuginone:**

Routes of exposure	: Dermal
Species	: Guinea pig
Result	: Sensitizer

**Germ cell mutagenicity**

Not classified based on available information.

**Components:****Lactic acid:**

Genotoxicity in vitro	: Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: negative Remarks: Based on data from similar materials
	Test Type: In vitro mammalian cell gene mutation test Method: OECD Test Guideline 476 Result: negative Remarks: Based on data from similar materials
	Test Type: Chromosome aberration test in vitro Method: OECD Test Guideline 473 Result: negative Remarks: Based on data from similar materials



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Genotoxicity in vitro	:	Test Type: Ames test Result: positive  Test Type: Mouse Lymphoma Result: negative  Test Type: Chromosomal aberration Test system: human lymphoblastoid cells Result: negative  Test Type: DNA damage and repair, unscheduled DNA synthesis in mammalian cells (in vitro) Result: negative
Genotoxicity in vivo	:	Test Type: Micronucleus test Species: Mouse Cell type: Bone marrow Application Route: Oral Result: negative  Test Type: Cytogenetic assay Species: Rat Application Route: Oral Result: negative  Test Type: DNA Repair Species: Mouse Application Route: Oral Result: negative

**Carcinogenicity**

Not classified based on available information.

**Components:****Lactic acid:**

Species	:	Rat
Application Route	:	Ingestion
Exposure time	:	2 Years
Result	:	negative
Remarks	:	Based on data from similar materials

**Halofuginone:**

Species	:	Mouse
Application Route	:	Oral
NOAEL	:	0.24 mg/kg body weight
Result	:	negative

Species	:	Rat
Application Route	:	Oral
Exposure time	:	63 weeks

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NOAEL	: 0.36 mg/kg body weight
Result	: negative
Species	: Rat
Application Route	: Oral
Exposure time	: 26 Months
NOAEL	: 0.09 - 0.18 mg/kg body weight
Result	: negative

**Reproductive toxicity**

Not classified based on available information.

**Components:****Lactic acid:**

Effects on fetal development	: Test Type: Embryo-fetal development Species: Mouse Application Route: Ingestion Result: negative
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**Halofuginone:**

Effects on fertility	: Test Type: Fertility Species: Mouse Application Route: Oral Fertility: NOAEL: 0.126 mg/kg body weight Result: No effects on fertility.  Test Type: Fertility Species: Dog Application Route: Oral Fertility: LOAEL: 0.067 mg/kg body weight Result: Effects on fertility.  Test Type: Three-generation reproduction toxicity study Species: Mouse Application Route: Oral General Toxicity F1: LOAEL: 0.063 mg/kg body weight Symptoms: Reduced body weight Result: No effects on fertility and early embryonic development were detected.
Effects on fetal development	: Test Type: Embryo-fetal development Species: Rat Application Route: Oral General Toxicity Maternal: LOAEL: 0.34 mg/kg body weight Embryo-fetal toxicity.: NOAEL: 0.67 mg/kg body weight Result: No embryo-fetal toxicity., No teratogenic effects.  Test Type: Embryo-fetal development Species: Rabbit Application Route: Oral General Toxicity Maternal: NOAEL: 0.025 mg/kg body weight Embryo-fetal toxicity.: NOAEL: 0.076 mg/kg body weight Result: No embryo-fetal toxicity., No teratogenic effects.

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Reproductive toxicity - Assessment : Some evidence of adverse effects on sexual function and fertility, based on animal experiments.

**STOT-single exposure**

Not classified based on available information.

**STOT-repeated exposure**

Not classified based on available information.

**Components:****Halofuginone:**

Target Organs : Blood  
Assessment : Causes damage to organs through prolonged or repeated exposure.

**Repeated dose toxicity****Components:****Lactic acid:**

Species : Rat  
NOAEL : > 100 mg/kg  
Application Route : Ingestion  
Exposure time : 13 Weeks  
Remarks : Based on data from similar materials

Species : Rat  
LOAEL : 886 mg/kg  
Application Route : Skin contact  
Exposure time : 13 Weeks

**Halofuginone:**

Species : Mouse  
NOAEL : 0.07 mg/kg  
LOAEL : 0.16 mg/kg  
Application Route : Oral  
Exposure time : 4 Weeks  
Target Organs : Blood

Species : Rat  
NOAEL : 0.13 mg/kg  
LOAEL : 0.88 mg/kg  
Application Route : Oral  
Exposure time : 13 Weeks  
Target Organs : Liver

Species : Dog  
NOAEL : 0.067 mg/kg  
LOAEL : 0.134 mg/kg  
Application Route : Oral  
Exposure time : 13 Weeks  
Target Organs : Blood

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Species	: Dog
NOAEL	: 0.075 mg/kg
LOAEL	: 0.16 mg/kg
Application Route	: Oral
Exposure time	: 26 Weeks
Target Organs	: Blood

**Aspiration toxicity**

Not classified based on available information.

**Experience with human exposure****Components:****Halofuginone:**

General Information	: No human information is available.
Inhalation	: Remarks: May cause irritation of respiratory tract.
Skin contact	: Remarks: May cause skin irritation and/or dermatitis. May cause sensitization by skin contact. Can be absorbed through skin.
Eye contact	: Remarks: May irritate eyes.

**SECTION 12. ECOLOGICAL INFORMATION****Ecotoxicity****Components:****Lactic acid:**

Toxicity to fish	: LC50 (Danio rerio (zebra fish)): > 100 mg/l Exposure time: 96 h Method: OECD Test Guideline 203 Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	: EC50 (Daphnia magna (Water flea)): > 100 mg/l Exposure time: 48 h Method: OECD Test Guideline 202 Remarks: Based on data from similar materials
Toxicity to algae/aquatic plants	: ErC50 (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials  NOEC (Pseudokirchneriella subcapitata (green algae)): > 100 mg/l Exposure time: 72 h Method: OECD Test Guideline 201 Remarks: Based on data from similar materials
Toxicity to microorganisms	: EC50: > 10 - 100 mg/l Exposure time: 3 h Method: OECD Test Guideline 209

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Remarks: Based on data from similar materials

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Toxicity to fish	: LC50 (Oncorhynchus mykiss (rainbow trout)): 1.8 mg/l Exposure time: 96 h Remarks: Based on data from similar materials  LC50 (Cyprinus carpio (Carp)): 0.3 mg/l Exposure time: 72 h Remarks: Based on data from similar materials  LC50 (Lepomis macrochirus (Bluegill sunfish)): 0.12 mg/l Exposure time: 96 h Remarks: Based on data from similar materials
Toxicity to daphnia and other aquatic invertebrates	: EC50 (Daphnia magna (Water flea)): 0.02 mg/l Exposure time: 48 h Remarks: Based on data from similar materials
Toxicity to algae/aquatic plants	: EC50 (Chlorella pyrenoidosa): 46 mg/l Method: OECD Test Guideline 201 Remarks: Based on data from similar materials

**Persistence and degradability****Components:****Lactic acid:**

Biodegradability	: Result: Not readily biodegradable. Remarks: Based on data from similar materials
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**Halofuginone:**

Biodegradability	: Result: Not readily biodegradable.
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**Bioaccumulative potential****Components:****Lactic acid:**

Partition coefficient: n-octanol/water	: log Pow: -0.62
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**Halofuginone:**

Partition coefficient: n-octanol/water	: log Pow: 1.18
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**Mobility in soil****Components:****Halofuginone:**

Distribution among environmental compartments	: log Koc: 3.87 Method: FDA 3.08
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**Other adverse effects**

No data available

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

Waste from residues	:	Do not dispose of waste into sewer. Dispose of in accordance with local regulations.
Contaminated packaging	:	Empty containers should be taken to an approved waste handling site for recycling or disposal. If not otherwise specified: Dispose of as unused product.

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

Not regulated as a dangerous good

**IATA-DGR**

Not regulated as a dangerous good

**IMDG-Code**

Not regulated as a dangerous good

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

Not applicable for product as supplied.

**Domestic regulation****NOM-002-SCT**

Not regulated as a dangerous good

**Special precautions for user**

Not applicable

**SECTION 15. REGULATORY INFORMATION****Safety, health and environmental regulations/legislation specific for the substance or mixture**

Federal Law for the control of chemical precursors, essential chemical products and machinery for producing capsules, tablets and pills.	:	Not applicable
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**The ingredients of this product are reported in the following inventories:**

AICS	:	not determined
DSL	:	not determined
IECSC	:	not determined

**SECTION 16. OTHER INFORMATION**

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**Full text of other abbreviations**

AIIC - Australian Inventory of Industrial Chemicals; 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; 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; TECl - Thailand Existing Chemicals Inventory; 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/>

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

The information is considered as correct, but not exhaustive, and will be used only as a guide, which is based in the current knowledge of the substance or mixture, and is applicable to proper safety precautions for the product.

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