

**Formoterol Formulation**

Version	Revision Date:	SDS Number:	Date of last issue: 05/24/2017
4.0	10/13/2017	525398-00007	Date of first issue: 02/23/2016

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**SECTION 1. IDENTIFICATION**

Product name : Formoterol Formulation

**Manufacturer or supplier's details**

Company name of supplier : Merck & Co., Inc

Address : 2000 Galloping Hill Road  
Kenilworth - New Jersey - USA 1685

Telephone : 908-740-4000

Telefax : 908-735-1496

Emergency telephone : 1-908-423-6000

E-mail address : EHSDATASTEWARD@merck.com

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

Recommended use : Pharmaceutical

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**SECTION 2. HAZARDS IDENTIFICATION****GHS classification in accordance with 29 CFR 1910.1200**

Combustible dust

Specific target organ systemic toxicity - single exposure (Oral) : Category 1 (Cardio-vascular system, Central nervous system)

Specific target organ systemic toxicity - single exposure (Inhalation) : Category 1 (Cardio-vascular system, Central nervous system)

Specific target organ systemic toxicity - repeated exposure (Oral) : Category 1 (Heart)

Specific target organ systemic toxicity - repeated exposure (Inhalation) : Category 1 (Heart)

**GHS label elements**

Hazard pictograms :



Signal Word : Danger

Hazard Statements : If small particles are generated during further processing,

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handling or by other means, may form combustible dust concentrations in air.  
H370 Causes damage to organs (Cardio-vascular system, Central nervous system) if swallowed.  
H370 Causes damage to organs (Cardio-vascular system, Central nervous system) if inhaled.  
H372 Causes damage to organs (Heart) through prolonged or repeated exposure if swallowed.  
H372 Causes damage to organs (Heart) through prolonged or repeated exposure if inhaled.

**Precautionary Statements**

:

**Prevention:**

P260 Do not breathe dust.  
P264 Wash skin thoroughly after handling.  
P270 Do not eat, drink or smoke when using this product.

**Response:**

P307 + P311 IF exposed: Call a POISON CENTER or doctor/physician.

**Storage:**

P405 Store locked up.

**Disposal:**

P501 Dispose of contents/ container to an approved waste disposal plant.

**Other hazards**

|| Dust contact with the eyes can lead to mechanical irritation.  
|| Contact with dust can cause mechanical irritation or drying of the skin.

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

Substance / Mixture : Mixture

**Hazardous ingredients**

Chemical name	CAS-No.	Concentration (% w/w)
Formoterol	43229-80-7	< 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.

|| In case of skin contact : Wash with water and soap.  
Get medical attention if symptoms occur.

|| In case of eye contact : If in eyes, rinse well with water.

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	Get medical attention if irritation develops and persists.
If swallowed	: If swallowed, DO NOT induce vomiting unless directed to do so by medical personnel. Get medical attention. Rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person.
Most important symptoms and effects, both acute and delayed	: Causes damage to organs if swallowed. Causes damage to organs if inhaled. Causes damage to organs through prolonged or repeated exposure if swallowed. Causes damage to organs through prolonged or repeated exposure if inhaled. Contact with dust can cause mechanical irritation or drying of the skin. Dust contact with the eyes can lead to mechanical 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.
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 fighting	: Exposure to combustion products may be a hazard to health.
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, protection	: Use personal protective equipment.
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| tive equipment and emergency procedures               | : | Follow safe handling advice and personal protective equipment recommendations.   |
| Environmental precautions                             | : | Discharge into the environment must be avoided. Prevent further leakage or spillage if safe to do so. 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 | : | Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. 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          | : | Static electricity may accumulate and ignite suspended dust causing an explosion. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres.  |
| Local/Total ventilation     | : | Use with local exhaust ventilation.  |
| Advice on safe handling     | : | Do not breathe dust.<br>Do not swallow.<br>Avoid contact with eyes.<br>Avoid prolonged or repeated contact with skin.<br>Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment<br>Minimize dust generation and accumulation.<br>Keep container closed when not in use.<br>Keep away from heat and sources of ignition.<br>Take precautionary measures against static discharges.<br>Take care to prevent spills, waste and minimize release to the environment. |
| Conditions for safe storage | : | Keep in properly labeled containers.<br>Store locked up.<br>Store in accordance with the particular national regulations.  |
| Materials to avoid          | : | Do not store with the following product types:<br>Strong oxidizing agents<br>Organic peroxides<br>Explosives   |

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Gases

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

## Ingredients with workplace control parameters

Ingredients	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Formoterol	43229-80-7	TWA	0.05 µg/m <sup>3</sup> (OEB 5)	Merck
		Wipe limit	0.5 µg/100 cm <sup>2</sup>	Merck

**Engineering measures** : Use closed processing systems or containment technologies to control at source (e.g., glove boxes/isolators) and to prevent leakage of compounds into the workplace. All engineering controls should be implemented by facility design and operated in accordance with GMP principles to protect products, workers, and the environment. No open handling permitted. Totally enclosed processes and materials transport systems are required. Operations require the use of appropriate containment technology designed to prevent leakage of compounds into the workplace.

## Personal protective equipment

**Respiratory protection** : General and local exhaust ventilation is recommended to maintain vapor exposures below recommended limits. Where concentrations are above recommended limits or are unknown, appropriate respiratory protection should be worn. Follow OSHA respirator regulations (29 CFR 1910.134) and use NIOSH/MSHA approved respirators. Protection provided by air purifying respirators against exposure to any hazardous chemical is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstance where air purifying respirators may not provide adequate protection.

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.

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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.
Hygiene measures	: Ensure that eye flushing systems and safety showers are located 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.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

Appearance	: powder
Color	: No data available
Odor	: No information available.
Odor Threshold	: No data available
pH	: No data available
Melting point/freezing point	: No data available
Initial boiling point and boiling range	: No data available
Flash point	: Not applicable
Evaporation rate	: Not applicable
Flammability (solid, gas)	: May form explosive dust-air mixture during processing, handling or other means.
Flammability (liquids)	: No data available
Upper explosion limit / Upper flammability limit	: No data available
Lower explosion limit / Lower flammability limit	: No data available
Vapor pressure	: Not applicable
Relative vapor density	: Not applicable

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Relative density	:	No data available
Density	:	No data available
Solubility(ies)	:	
Water solubility	:	No data available
Partition coefficient: n-octanol/water	:	Not applicable
Autoignition temperature	:	No data available
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.
Particle size	:	No data available

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**SECTION 10. STABILITY AND REACTIVITY**

Reactivity	:	Not classified as a reactivity hazard.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Dust can form an explosive mixture in air. Can react with strong oxidizing agents.
Conditions to avoid	:	None known.
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  
Ingestion  
Eye contact

**Acute toxicity**

Not classified based on available information.

**Ingredients:****Formoterol:**

Acute oral toxicity	:	LD50 (Rat): 3,130 mg/kg
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	LD50 (Mouse): 6,700 mg/kg
Acute inhalation toxicity	: LC50 (Rat): 1.5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	: Remarks: No data available
Acute toxicity (other routes of administration)	: LD50 (Rat): 1,000 mg/kg Application Route: Subcutaneous  LD50 (Mouse): 640 mg/kg Application Route: Subcutaneous

**Skin corrosion/irritation**

Not classified based on available information.

**Ingredients:****Formoterol:**

Species: Rabbit  
Result: No skin irritation  
Remarks: slight irritation

**Serious eye damage/eye irritation**

Not classified based on available information.

**Ingredients:****Formoterol:**

Species: Rabbit  
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:****Formoterol:**

Test Type: Maximization Test  
Routes of exposure: Dermal  
Species: Guinea pig  
Result: Not a skin sensitizer.

**Germ cell mutagenicity**

Not classified based on available information.



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**Ingredients:****Formoterol:**

Genotoxicity in vitro	:	Test Type: In vitro mammalian cell gene mutation test Result: negative  Test Type: Chromosomal aberration 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 Application Route: Oral Result: negative  Test Type: Micronucleus test Species: Rat Application Route: Oral Result: negative

**Carcinogenicity**

Not classified based on available information.

**Ingredients:****Formoterol:**

Species: Rat  
Application Route: Oral  
Exposure time: 2 Years  
LOAEL: 0.5 mg/kg body weight  
Target Organs: Ovary  
Remarks: The mechanism or mode of action may not be relevant in humans.

Species: Mouse  
Application Route: Oral  
Exposure time: 18 month(s)  
LOAEL: 2 mg/kg body weight  
Target Organs: Adrenal gland, Liver, Uterus (including cervix)  
Remarks: The mechanism or mode of action may not be relevant in humans.

Carcinogenicity - Assessment : Limited evidence of carcinogenicity in animal studies

**IARC**

No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

**OSHA**

No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

**NTP**

No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen

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by NTP.

**Reproductive toxicity**

Not classified based on available information.

**Ingredients:****Formoterol:**

Effects on fertility	:	Test Type: Fertility/early embryonic development Species: Rat Application Route: Oral Fertility: NOAEL: 3 mg/kg body weight Result: No effects on fertility.
Effects on fetal development	:	Test Type: Embryo-fetal development Species: Rat Application Route: Oral Developmental Toxicity: LOAEL: 0.2 mg/kg body weight Result: Embryo-fetal toxicity., No malformations were observed.  Test Type: Embryo-fetal development Species: Rat Application Route: Oral Developmental Toxicity: LOAEL: 3 mg/kg body weight Result: Malformations were observed.  Test Type: Embryo-fetal development Species: Rat Application Route: inhalation (dust/mist/fume) Developmental Toxicity: NOAEL: 1.2 mg/kg body weight Result: No embryo-fetal toxicity.  Test Type: Embryo-fetal development Species: Rabbit Application Route: Oral Developmental Toxicity: LOAEL: 60 mg/kg body weight Result: Embryo-fetal toxicity., No malformations were observed.
Reproductive toxicity - Assessment	:	Some evidence of adverse effects on development, based on animal experiments.

**STOT-single exposure**

Causes damage to organs (Cardio-vascular system, Central nervous system) if swallowed.  
Causes damage to organs (Cardio-vascular system, Central nervous system) if inhaled.

**Product:**

Routes of exposure: Ingestion, Inhalation  
Target Organs: Cardio-vascular system, Central nervous system  
Assessment: Causes damage to organs.

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**Ingredients:****Formoterol:**

Routes of exposure: Ingestion, inhalation (dust/mist/fume)  
Target Organs: Cardio-vascular system, Central nervous system  
Assessment: Causes damage to organs.

**STOT-repeated exposure**

Causes damage to organs (Heart) through prolonged or repeated exposure if swallowed.  
Causes damage to organs (Heart) through prolonged or repeated exposure if inhaled.

**Product:**

Routes of exposure: Inhalation, Ingestion  
Target Organs: Heart  
Assessment: Causes damage to organs through prolonged or repeated exposure.

**Ingredients:****Formoterol:**

Routes of exposure: Ingestion, inhalation (dust/mist/fume)  
Target Organs: Heart  
Assessment: Causes damage to organs through prolonged or repeated exposure.

**Repeated dose toxicity****Ingredients:****Formoterol:**

Species: Dog  
LOAEL:  $\geq 1.5$  mg/kg  
Application Route: Inhalation  
Exposure time: 13 Weeks  
Target Organs: Heart

Species: Rat  
NOAEL: 0.14 mg/kg  
Application Route: Inhalation  
Exposure time: 13 Weeks  
Target Organs: Heart

Species: Dog  
LOAEL: 0.003 mg/kg  
Application Route: Oral  
Exposure time: 1 y  
Target Organs: Heart

Species: Rat  
LOAEL: 0.3 mg/kg  
Application Route: Oral  
Exposure time: 1 y  
Target Organs: Heart

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**Aspiration toxicity**

Not classified based on available information.

**Experience with human exposure****Ingredients:****Formoterol:**

Inhalation	:	Target Organs: Heart Symptoms: Palpitation, Tremors, Dizziness, Headache, dry mouth, Nausea, Fatigue
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**SECTION 12. ECOLOGICAL INFORMATION****Ecotoxicity****Ingredients:****Formoterol:**

Toxicity to fish	:	LC50 (Oncorhynchus mykiss (rainbow trout)): > 120 mg/l Exposure time: 96 h Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): > 114 mg/l Exposure time: 48 h Method: OECD Test Guideline 202
Toxicity to algae	:	EC50 (Pseudokirchneriella subcapitata (green algae)): 94 mg/l Exposure time: 72 h Method: OECD Test Guideline 201  NOEC (Pseudokirchneriella subcapitata (green algae)): 30 mg/l Exposure time: 72 h Method: OECD Test Guideline 201

**Persistence and degradability**

No data available

**Bioaccumulative potential****Ingredients:****Formoterol:**

Partition coefficient: n-octanol/water	:	log Pow: 0.41
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**Mobility in soil**

No data available

**Other adverse effects**

No data available

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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.  
If not otherwise specified: Dispose of as unused product.

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**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****49 CFR**

Not regulated as a dangerous good

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**SECTION 15. REGULATORY INFORMATION****EPCRA - Emergency Planning and Community Right-to-Know****CERCLA Reportable Quantity**

This material does not contain any components with a CERCLA RQ.

**SARA 304 Extremely Hazardous Substances Reportable Quantity**

This material does not contain any components with a section 304 EHS RQ.

**SARA 302 Extremely Hazardous Substances Threshold Planning Quantity**

This material does not contain any components with a section 302 EHS TPQ.

**SARA 311/312 Hazards** : Combustible dust  
Specific target organ toxicity (single or repeated exposure)

**SARA 313** : This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

**US State Regulations****Pennsylvania Right To Know**

Lactose

63-42-3

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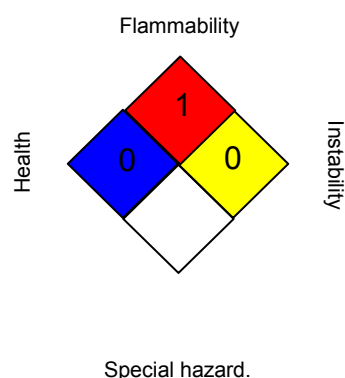
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**California Prop. 65**

This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

**The ingredients of this product are reported in the following inventories:**

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

**SECTION 16. OTHER INFORMATION****Further information****NFPA:****HMIS® IV:**

HEALTH	*	4
FLAMMABILITY		3
PHYSICAL HAZARD		0

HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. The "\*" represents a chronic hazard, while the "/" represents the absence of a chronic hazard.

**Full text of other abbreviations**

AICS - Australian Inventory of Chemical Substances; ASTM - American Society for the Testing of Materials; bw - Body weight; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DOT - Department of Transportation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; EHS - Extremely Hazardous Substance; 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; HMIS - Hazardous Materials Identification System; 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; MSHA - Mine Safety and Health Administration; n.o.s. - Not Oth-

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erwise Specified; NFPA - National Fire Protection Association; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; 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; RCRA - Resource Conservation and Recovery Act; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RQ - Reportable Quantity; SADT - Self-Accelerating Decomposition Temperature; SARA - Superfund Amendments and Reauthorization Act; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance 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

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/>

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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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