

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product name: Conductor
Synonyms: Conductive Ink, Conductive Paste, Silver Ink, Silver Conductor, Silver Paste
Supplier: Voltera Inc.
100-113 Breithaupt St.
Kitchener, ON, N2H5G9, Canada
support@voltera.io
Emergency: CANUTEC 1+ 613-996-6666
Intended use: Circuit board prototyping

SECTION 2: HAZARDS IDENTIFICATION

Classification of the substance or mixture

Reproductive Category 1B
toxicity

Label Elements: GHS label elements

Hazard
pictograms

**GHS08****Signal word:** Danger**Hazard statements**

H360 May damage fertility or the unborn child.

Precautionary statements**Prevention:**

P201 Obtain special instructions before use
P202 Do not handle until all safety precautions have been read and understood.
P280 Wear protective gloves/protective clothing/eye protection/face protection

Response:

P308+P313 IF Exposed or concerned: Get medical advice / attention.

Storage:

P405 Store locked up.

Disposal:

P501 Dispose of contents/container in accordance with local/regional/national/international regulations

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Substance/Mixture: Mixture**Chemical Nature:** inorganic**Hazardous Components:**

CAS-No.	Chemical Name	Concentration (% w/w)
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First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

7440-22-4	Silver	$\geq 70 - < 90$
872-50-4	1-methyl-2-pyrrolidone	$\geq 0.1 - < 1$
108-95-2	Phenol	$\geq 0.1 - < 1$

SECTION 4: FIRST AID MEASURES

General Advice: First aiders need to protect themselves. Move out of dangerous area. Show this SDS to the doctor in attendance.

If inhaled: Move to fresh air. Get medical attention.

In case of skin contact: Take off all contaminated clothing immediately. Wash off with Polyethylene glycol 400. Get medical attention immediately.

In case of eye contact: In case of eye contact, remove contact lens and rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Keep eye wide open while rinsing. Protect unharmed eye. Call physician immediately.

If swallowed: Immediately give large quantities of water to drink. DO NOT induce vomiting. Get medical attention immediately.

Most important symptoms and effects, both acute and delayed: May damage fertility or the unborn child.

Notes to physician: Treat symptomatically

SECTION 5: FIRE-FIGHTING MEASURES

Suitable extinguishing media:

Use extinguishing measures which are appropriate to the local circumstances and surrounding environment.

Specific hazards during fire-fighting:

Exposure to decomposition products may be a hazard to health.

Hazardous combustion products:

Silver compounds
Carbon oxide.
Nitrogen oxides (NO_x)

Further Information:

Use a water spray to cool fully closed containers.
Prevent fire extinguishing water from contaminating surface water or the ground water system.

Special protective equipment for firefighters:

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:

Follow safe handling advice and personal protective equipment recommendations.
Ensure adequate ventilation.
Evacuate personnel to safe areas.

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Refer to protective measures listed in sections 7 and 8.

Environmental Precautions:

Do not allow contact with soil, surface or ground water.

Do not let product enter drains.

If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up:

Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).

Sweep up or vacuum spillage and collect in suitable container for disposal.

SECTION 7: HANDLING AND STORAGE

Advice on safe handling:

Provide sufficient air exchange and/or exhaust in work rooms.

Wear personal protective equipment.

Avoid inhalation, ingestion and contact with skin and eyes.

Smoking, eating, and drinking should be prohibited in the application area.

Conditions for safe storage:

Keep tightly closed in a dry, cool, and well-ventilated place.

Keep locked up or in an area accessible only to qualified or authorized persons.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters:

COMPONENTS	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Silver	7440-22-4	TWA	0.1 mg/m ³	CA AB OEL
		TWAEV	0.1 mg/m ³	CA QC OEL
		TWA	0.01 mg/m ³ (Silver)	CA BC OEL
		STEL	0.03 mg/m ³ (Silver)	CA BC OEL
1-methyl-2-pyrrolidone	872-50-4	TWA (Dust and fume)	0.1 mg/m ³	ACGIH
		TWA	400 mg/m ³	CA ON OEL
Phenol	108-95-2	TWA	5 ppm 19 mg/m ³	CA AB OEL
		TWA	5 ppm	CA BC OEL
		TWAEV	5 ppm 19 mg/m ³	CA QC OEL
		TWA	5 ppm	ACGIH

Biological occupation exposure limits

COMPONENTS	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
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First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

N-Methyl-2-pyrrolidone	872-50-4	5-Hydroxy-N-methyl-2-pyrrolidone	Urine	End of shift (as soon as possible after exposure ceases)	100 mg/l	ACGIH BEI
Phenol	108-95-2	Phenol	Urine	End of shift (as soon as possible after exposure ceases)	250 mg/g Creatinine	ACGIH BEI

Engineering Measures: Provide sufficient air exchange and/or exhaust in work rooms.

Personal Protective Equipment:

Respiratory protection: Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.

Filter type: Recommended Filter type: ABEK-P

Hand protection: Before removing gloves, clean them with soap and water. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. As the product is a mixture of several substances, the durability of the glove materials cannot be calculated in advance and has to be tested before use.

Eye protection: Safety glasses with side-shields

Skin and body protection: Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures: Keep away from food and drink. Wash hands before breaks and at the end of the workday. Keep working clothes separately. Remove and wash contaminated clothing and gloves, including the inside, before re-use.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance : Paste
 Color : Brown
 Odour : Mild
 Odour Threshold: : No data available
 pH : No data available
 Melting point/range : No data available
 Boiling point/range : No data available

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Flash point	:	No data available
Evaporation rate	:	No data available
Flammability (solid, gas)	:	No data available
Self-ignition	:	No data available
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	No data available
Solubility(ies)		
Water solubility	:	No data available
Solubility in other solvents	:	No data available
Partition coefficient: n-octanol/water	:	No data available
Auto-ignition temperature	:	No data available
Decomposition temperature	:	No data available
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	> 40 [mm ² /s] (23°C) > 20.5 [mm ² /s] (40°C)
Explosive properties		No data available
Oxidizing properties		No data available

SECTION 10: STABILITY AND REACTIVITY

Reactivity	:	No dangerous reaction known under conditions of normal use.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	No data available
Incompatible materials	:	No data available

SECTION 11: TOXICOLOGICAL INFORMATION

Acute toxicity

Not classified based on available information.

Product:

Acute oral toxicity	:	Acute toxicity estimate: >5,000 mg/kg Method: Calculation method
Acute inhalation toxicity:	:	Acute toxicity estimate: >40 mg/l Exposure time: 4 h Test atmosphere: vapour Method: Calculation method.
Acute dermal toxicity:	:	Acute toxicity estimate: >5,000 mg/kg Method: Calculation method

Components:

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Silver:

Acute oral toxicity : LD50 (Rat): >5,000 mg/kg
 Method: OECD Test Guideline 401
 Remarks: Based on data from similar materials

1-methyl-2-pyrrolidone

Acute oral toxicity : LD50 (Rat): 4,150 mg/kg
 Acute inhalation toxicity : LD50 (Rat): >5 mg/l
 Exposure time: 4 h
 Test atmosphere: dust/mist
 Method: OECD Test Guideline 403
 Assessment: the substance or mixture has no acute inhalation toxicity

Acute dermal toxicity : LD50 (Rat): >5,000 mg/kg

Phenol:

Acute oral toxicity : LD50 (Rat): 650 mg/kg
 Method: OECD Test Guideline 401

Acute toxicity estimate (Humans): 140-290 mg/kg
 Method: Expert judgement
 Acute inhalation toxicity : LC0 (Rat): 0.9 mg/l
 Exposure time: 8 h
 Test atmosphere: dust/mist
 Assessment: Corrosive to the respiratory tract.

Acute toxicity estimate (Humans): > 0.9 mg/l
 Exposure time: 5 h
 Test atmosphere: dust/mist
 Method: Expert judgement
 Acute dermal toxicity : LD50 (Rabbit): 660 mg/kg
 Method: OECD Test Guideline 402

Acute toxicity estimate (Humans): 300 mg/kg
 Method: Expert judgement

Skin corrosion/Irritation

Not classified based on available information.

Components:

Silver:

Species : Rabbit
 Method : OECD Test Guideline 404
 Result : No skin irritation

1-methyl-2-pyrrolidone

Species : Rabbit
 Method : OECD Test Guideline 404
 Result : Skin irritation

Phenol:

Species : Rabbit
 Result : Corrosive after 3 minutes to 1 hour of exposure

Serious eye damage/eye irritation

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Not classified based on available information.

Components:

Silver:

Species : Rabbit
Method : OECD Test Guideline 405
Result : No eye irritation

1-methyl-2-pyrrolidone

Species : Rabbit
Result : Irritation to eyes, reversing within 21 days

Phenol:

Species : Rabbit
Result : Irreversible effect on the eye
Method : OECD Test Guideline 405

Respiratory or skin sensitization**Skin sensitization**

Not classified based on available information.

Respiratory sensitization

Not classified based on available information.

Components:

Silver:

Test Type : Maximization test
Exposure routes : Skin contact
Species : Guinea pig
Method : OECD Test Guideline 406
Result : Negative
Remarks : Based on data from similar materials

1-methyl-2-pyrrolidone:

Test Type : Local lymph node assay (LLNA)
Exposure routes : Skin contact
Species : Mouse
Method : OECD Test Guideline 429
Result : Negative
Remarks : Based on data from similar materials

Phenol:

Test type : Buehler Test
Exposure routes : Skin contact
Species : Guinea pig
Method : OECD Test Guideline 406
Result : Negative

Germ cell mutagenicity

Not classified based on available information.

Components:

Silver:

Genotoxicity in vitro : Test Type: Chromosome aberration test in vitro
Result: Negative

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Genotoxicity in vivo	:	Remarks: Based on data from similar materials Test Type: Mammalian erythrocytemicronucleus test (in vivo cytogenetic assay) Species: Rat Application Route: Ingestion Result: Negative
1-methyl-2-pyrrolidone Genotoxicity in vitro	:	Test Type: Bacterial reverse mutation assay (AMES) Method: OECD Test Guideline 471 Result: Negative
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Application route: Ingestion Method: OECF Test Guideline 474 Result: Negative
Phenol:		
Genotoxicity in vitro	:	Test Type: Chromosome aberration test in vitro Method: OECD Test Guideline 473 Result: Positive
Genotoxicity in vivo	:	Test Type: Mammalian erythrocyte micronucleus test (in vivo cytogenetic assay) Species: Mouse Application Route: Intraperitoneal injection Method: OECD Test Guideline 474 Result: positive Remarks: Annex VI From 1272/2008
Germ cell mutagenicity – Assessment	:	Positive result(s) from in vivo mammalian somatic cell mutagenicity tests.

Carcinogenicity

Not classified based on available information.

Components:

1-methyl-2-pyrrolidone		
Species	:	Mouse
Application route	:	Ingestion
Method	:	OECD Test Guideline 451
Result	:	Positive
Remarks	:	The mechanism or mode of action may not be relevant in humans.
Species	:	Mouse
Application Route	:	Inhalation
Result	:	Negative
Phenol:		
Species	:	Mouse
Application Roue	:	Ingestion
Exposure Time	:	103 weeks
Method	:	OECD Test Guideline 4510
Result	:	Negative

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Reproductive toxicity

May damage fertility or the unborn child

Components:

Silver:

Effects on foetal development : Test Type: Embryo-foetal development
 Species: Rat
 Application route: Ingestion
 Result: Negative
 Remarks: Based on data from similar materials

1-methyl-2-pyrrolidone

Effects on fertility : Test Type: Two-generation reproduction toxicity study
 Species: Rat
 Application Route: Ingestion
 Method: OECD Test Guideline 416
 Result: negative

Effects on foetal development : Test Type: Embryo-foetal development
 Species: Rat
 Application Route: Ingestion
 Method: OECD Test Guideline 414
 Result: positive

Test Type: Two-generation reproduction toxicity study
 Species: Rat
 Application Route: Ingestion
 Method: OECD Test Guideline 416
 Result: positive

Reproductive toxicity – Assessment : Clear evidence of adverse effects on development, based on animal experiments.

Phenol:

Effects on fertility : Test Type: Two-generation reproduction toxicity study
 Species: Rat
 Application Route: Ingestion
 Method: OECD test Guideline 416
 Result: negative

Effects on foetal development : Test Type: Embryo-foetal development
 Species: Mouse
 Application Route: Ingestion
 Method: OECD Test Guideline 414
 Result: negative

STOT - Single exposure

Not classified based on available information.

Components:

1-methyl-2-pyrrolidone

Assessment : May cause respiratory irritation

STOT – Repeated exposure

Not classified based on available information.

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Components:**Silver:**

Exposure routes : Inhalation (dust/mist/fume)
Assessment : No significant health effects observed in animals at concentrations of 0.2 mg/l/6h/d or less.

1-methyl-2-pyrrolidone:

Exposure routes : Inhalation (vapour)
Assessment : No significant health effects observed in animals at concentrations of 1 mg/l/6h/d or less.

Phenol:

Target organs : Central nervous system, Kidney, Liver, Skin
Assessment : May cause damage to organs through prolonged or repeated exposure.

Repeated dose toxicity**Components:****Silver:**

Species : Rat
NOAEL : 30 mg/kg
LOAEL : 125 mg/kg
Application Route : Ingestion
Exposure time : 13 Weeks
Method : OECD Test Guideline 408

Species : Rat
NOAEL : 0.133 mg/m³
Application Route : Inhalation (dust/mist/fume)
Exposure Time : 13 Weeks
Method : OECD Test Guideline 413

1-methyl-2-pyrrolidone:

Species : Rat
NOAEL : Inhalation (vapour)
Exposure time : 90 days
Method : OECD Test Guideline 413

Species : Rat
NOAEL : 169-217 mg/kg
Application Route : Ingestion
Exposure time : 90 days
Method : OECD Test Guideline 408

Species : Rabbit
NOAEL : 826 mg/kg
Application Route : Skin contact
Exposure time : 20 Days

Phenol:

Species : Rat
NOAEL : 300 mg/kg
Application route : Ingestion
Exposure time : 90 Days
Method : OECD Test Guideline 408

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Species : Rat
 NOAEL : ≥ 0.1 mg/l
 Application Route : Inhalation (vapour)
 Exposure time : 74 Days

Species : Rabbit
 LOAEL : 260 mg/kg
 Application Route : Skin contact
 Exposure time : 18 Days

Aspiration toxicity

Not classified based on available information.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity

Components:

Silver:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): 0.0102 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)): 0.0287 mg/l
 Exposure time: 48 h

Toxicity to algae : EC50 (Pseudokirchneriella subcapitata (green algae)): 0.0184 mg/l
 Exposure time: 96 h
 Remarks: Based on data from similar materials

M-factor (Acute aquatic toxicity) : 10

Toxicity to fish (Chronic toxicity) : NOEC (Danio rerio (zebra fish)): 0.0059 mg/l
 Exposure time: 35 d

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : EC10 (Daphnia magna (water flea)): 0.00214 mg/l
 Exposure time: 21 d
 Remarks: Based on data from similar materials

M-factor (Chronic aquatic toxicity) : 10

1-methyl-2-pyrrolidone:

Toxicity to fish : LC50 (Oncorhynchus mykiss (rainbow trout)): >500 mg/l
 Exposure time: 96 h

Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (water flea)): >1000 mg/l
 Exposure time: 4824
 Method: DIN 38412

Toxicity to algae : EC50 (Desmodesmus subspicatus (green algae)): 600.5 mg/l
 Exposure time: 72 h
 Remarks: Based on data from similar materials

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : NOEC (Daphnia magna (water flea)): 12.5 mg/l
 Exposure time: 21 d
 Method: OECD Test Guideline 211

Phenol:

Toxicity to fish : LC50 (Pimephales promelas (fathead minnow)): 24 mg/l
 Exposure time: 96 h
 Toxicity to daphnia and other aquatic invertebrates : EC50 (Daphnia magna (water flea)): 3.1 mg/l
 Exposure time: 48 h
 Toxicity to algae : EC50 (Selenastrum capricornutum (green algae)): 61.1 mg/l
 Exposure time: 96 h
 Toxicity to fish (Chronic toxicity) : NOEC: 0.077 mg/l
 Exposure time: 60 d
 Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) : NOEC (Daphnia magna (water flea)): 10 mg/l
 Exposure time: 16 d
 Toxicity to microorganisms : LC50 (Nitrosomonas sp.): 21 mg/l
 Exposure time: 24 h

Persistence and degradability**Components:****1-methyl-2-pyrrolidone:**

Biodegradability : Result: Readily biodegradable.
 Biodegradation: 73%
 Exposure time: 28d
 Method: OECD Test Guideline 301C

phenol:

Biodegradability : Result: Readily biodegradable.
 Biodegradation: 62%
 Exposure time: 10d
 Method: OECD Test Guideline 301C

Bioaccumulative potential**Components:****Silver:**

Bioaccumulation : Species: Cyprinus carpio (Carp)
 Bioconcentration factor (BCF): 70
 Remarks: Based on data from similar materials

1-methyl-2-pyrrolidone:

Partition coefficient: n-octanol/water : Log Pow: -0.46

1-methyl-2-pyrrolidone:

Bioaccumulation : Species: Fish
 Bioconcentration factor (BCF): 17.5
 Method: OECD Test Guideline 305

Partition coefficient: n-octanol/water : Log Pow: 1.47

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13: DISPOSAL CONSIDERATIONS

Disposal Methods

Waste from Residues : If recycling is not practical, dispose of in compliance with local regulations.
Contaminated : Dispose of as unused product.
packaging

SECTION 14: TRANSPORT INFORMATION

Bioaccumulative potential**UNRTDG**

UN number : UN 3082
Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Silver)
Class : 9
Packing group : III
Labels : 9

IATA-DGR

UN/ID No. : UN 3082
Proper shipping name : Environmentally hazardous substance, liquid, n.o.s.
Class : 9
Packing group : III
Labels : Miscellaneous
Packing instruction : 964
(cargo aircraft)
Packing instruction : 964
(passenger aircraft)
Environmentally hazardous (Cargo) : Yes
Environmentally hazardous (Passenger) : Yes

IMDG-Code

UN number : UN 3082
Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Silver, silver)
Class : 9
Packing group : III
Labels : 9
EmS Code : F-A, S-F
Marine pollutant : Yes

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

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

Not applicable for product as supplied.

National Regulations**TDG**

UN NUMBER : Un 3082
Proper shipping name : ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Silver)
Class : 9
Packing group : III
Labels : 9
ERG Code : 171
Marine pollutant : Yes (Silver)

SECTION 15: REGULATORY INFORMATION

NPRI Components : Silver
1-methyl-2-pyrrolidone
Phenol
o-cresol
formaldehyde

The components of this product are reported in the following inventories:

DSL : All components of this product are on the Canadian DSL

Canadian lists

No substances are subject to a Significant New Activity Notification.

SECTION 16: OTHER INFORMATION

Full text of other abbreviations:

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% 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;

First issue: 2015-09-24
Revision date: 2018-06-26
Version: 3.0

IMO – International Maritime Organization;
ISHL – Industrial Safety and Health Law (Japan);
ISO – International Organisation for Standardization;
LECI – Lorea 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)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 – Phillipines 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;

Revision Date : 06/26/2018

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