1. Product and company identification

Trade Name

Crotonaldehyde

Manufacturer, importer, supplier
Celanese Ltd.
222 W. Las Colinas Blvd., Suite 900N
Irving, TX  75039
United States
Phone:  972 443 4000
Internet:  www.celanese.com

Transportation emergency phone numbers:
In USA, call  800 424 9300
Outside USA, call  +001 703 527 3887, collect calls accepted.

Identified uses
Chemical intermediate

2. Hazard Identification

GHS Classification

Hazards                  Category
Flammable liquid         Category 2
Serious eye damage/eye irritation Category 1
Germ cell mutagenicity   Category 2
Specific target organ systemic toxicity (single exposure) Category 3  Respiratory
Specific target organ systemic toxicity (repeated exposure) Category 2
Acute aquatic toxicity   Category 1
Chronic aquatic toxicity  Category 1
Acute oral toxicity      Category 3
Acute dermal toxicity    Category 1
Acute inhalation toxicity Category 2
Skin corrosion/irritation Category 2

Label elements

Signal Word: Danger
Hazard Statements
Highly flammable liquid and vapor
Toxic if swallowed
Fatal in contact with skin
Fatal if inhaled
Causes skin irritation
Causes serious eye damage
Suspected of causing genetic defects
May cause respiratory irritation
May cause damage to organs through prolonged or repeated exposure
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Precautionary statements
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
In case of fire:
Use foam, dry chemical, carbon dioxide (CO2) to extinguish.
Wear respiratory protection
Wear protective gloves/protective clothing/eye protection/face protection.
Wash face, hands and any exposed skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Do not get in eyes, on skin, or on clothing
Do not breathe dust/fume/gas/mist/vapors/spray.
Use only outdoors or in a well-ventilated area.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
Immediately call a POISON CENTER or doctor.
Wash contaminated clothing before reuse.
IF SWALLOWED: Immediately call a POISON CENTER/doctor/.
Rinse mouth
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
Immediately call a POISON CENTER or doctor.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Immediately call a POISON CENTER or doctor/physician
IF exposed or concerned: Get medical advice/attention.
Store locked up.
Store in a well-ventilated place. Keep cool.
Dispose of contents/container to an approved waste disposal plant.

3. Composition/information on ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>4170-30-3</td>
<td>&gt; 99.0</td>
</tr>
</tbody>
</table>
4. First aid measures

General Information
Remove contaminated, soaked clothing immediately and dispose of safely. Pay attention to own protection. In any case show the physician the Safety Data Sheet.

Skin
Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.

Eyes
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

Inhalation
Keep at rest. Move to fresh air. Call a physician immediately.

Ingestion
If swallowed give 1-2 glasses of water to drink immediately. Call a physician immediately.

Notes to physician
Observe for latent pulmonary edema. Treat as an alkaline substance (similar to ammonia).

5. Fire-fighting measures

NFPA: Health: 4 Flammability: 3 Instability: 2

Suitable extinguishing media
Foam, Dry chemical, Carbon dioxide (CO2)

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases
Under conditions giving incomplete combustion, hazardous gases produced may consist of
Carbon monoxide
Carbon dioxide (CO2)
Combustion gases of organic materials must in principle be graded as inhalation poisons
Vapors may travel to source of ignition and flash back

Special protective equipment for fire-fighters
self-contained breathing apparatus (EN 133).

Environmental precautions
Dike and collect water used to fight fire.

Other Information
Cool containers / tanks with water spray.

6. Accidental release measures
Personal precautions
Avoid contact with the skin and the eyes. Keep away from heat and sources of ignition. Provide adequate ventilation.

Isolation
Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. For small spills of 55 gallons or less, initially isolate 30 m (100 ft) in all directions. Protect people down wind for 0.2 km (0.1 mi.) in daytime and 0.5 km (0.3 mi.) at night. For large spills of greater than 55 gallons, initially isolate for 95 m (300 ft) in all directions. Protect people downwind for 1.0 km (0.6 mi.) in the daytime and 2.4 km (1.5 mi.) at night. Isolate for 800 meters or 0.5 miles in all directions if tank, rail car, or tank truck is involved in fire. Evacuate downwind areas as conditions warrant to prevent exposure and to allow vapors or fumes to dissipate. Material creates a special hazard because it floats on water.

Environmental precautions
Prevent further leakage or spillage. Do not discharge into the drains/surface waters/groundwater.

Methods for cleaning up
Soak up with inert absorbent material. Do not use rags, paper towels or combustible materials to clean up a spill, because spontaneous combustion can occur. Keep in suitable, closed containers for disposal. Dispose of in accordance with local regulations.

Authority Notification
Within the United States, call the National Response Center (800-424-8802) and appropriate state and local authorities if the quantity released over 24 hours is equal to or greater than the reportable quantity listed below:

100 lb/45.4kg

7. Handling and storage

Advice on safe handling
Vapors may form explosive mixtures with air. The pressure in sealed containers can increase under the influence of heat. Refill and handle product only in closed system. Provide sufficient air exchange and/or exhaust in work rooms.

Protection - fire and explosion:
Keep away from sources of ignition - No smoking. Vapours are heavier than air and may spread along floors. Take necessary action to avoid static electricity discharge. Ground and bond containers when transferring material. In case of fire, emergency cooling with water spray should be available.

Technical measures/Storage conditions
Keep tightly closed in a dry, cool and well-ventilated place. Handle an open container with care. Store under nitrogen.

Material storage
Store locked up. The product will oxidize in air and release heat. Oxidization creates acids and peroxides, that may lead to corrosive damages in storage and handling equipment.

Incompatible products
Keep away from: Acids, Bases, Amines, oxygen, Oxidizing agents, Reducing agents

8. Exposure controls / personal protection

OSHA Exposure Limits
Components TWA
Crotonaldehyde 2 PPM

ACGIH Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>Ceiling Limit Value:</th>
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<tr>
<td>Crotonaldehyde</td>
<td>0.3 PPM</td>
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Mexico National Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>LMPE - PPT</th>
<th>STEL</th>
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<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>6 mg/m³</td>
<td>18 mg/m³</td>
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</table>

<table>
<thead>
<tr>
<th>Components</th>
<th>Mexican Carcinogen Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>A3</td>
</tr>
</tbody>
</table>

Exposure controls

Engineering measures
General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems.

Protective equipment
A safety shower and eyewash should be readily available.

General advice
Avoid contact with skin and eyes. Do not breathe vapors or spray mist.
Respiratory protection

Based on workplace contaminant level and working limits of the respirator, use a respirator approved by NIOSH. The following is the minimum recommended equipment for an occupational exposure level. To estimate an occupational exposure level see Section 8 and Section 11.

For concentrations > 1 and < 10 times the occupational exposure level: Use air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s). The air purifying element must have an end of service life indicator, or a documented change out schedule must be established. Otherwise, use supplied air.

For concentrations more than 10 times the occupational exposure level and less than the lower of either 100 times the occupational exposure level or the IDLH: Use Type C full facepiece supplied-air respirator operated in positive-pressure or continuous-flow mode.

For concentrations > 100 times the occupational exposure level or greater than the IDLH level or unknown concentrations (such as in emergencies): Use self-contained breathing apparatus with full facepiece in positive-pressure mode or Type C positive-pressure full facepiece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system.

For escape: Use self-contained breathing apparatus with full facepiece or any respirator specifically approved for escape.

Skin protection:

Wear impervious clothing and gloves to prevent contact. Butyl rubber is recommended. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Unsuitable materials:

Latex

Eye/face protection:

Wear chemical goggles when there is a reasonable chance of eye contact. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.

9. Physical and chemical properties

Appearance

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>liquid</td>
</tr>
<tr>
<td>Color</td>
<td>yellowish</td>
</tr>
<tr>
<td>Odor</td>
<td>pungent</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>70.09</td>
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<tr>
<td>Flash point</td>
<td>13°C</td>
</tr>
<tr>
<td>Method</td>
<td>closed cup</td>
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<tr>
<td>Ignition temperature</td>
<td>165°C</td>
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<tr>
<td>Method</td>
<td>DIN 51794</td>
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<tr>
<td>Decomposition Temperature</td>
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<td>Lower explosion limit</td>
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<tr>
<td>Upper explosion limit</td>
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<tr>
<td>Boiling point/range</td>
<td>102.2°C @ 1013 hPa</td>
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<td>Density</td>
<td>0.852 g/ml @ 20°C</td>
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</table>
9. Physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>Not determined</td>
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<tr>
<td>Viscosity @ 20°C</td>
<td>0.27 mPa*s</td>
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<tr>
<td>Method</td>
<td>calculated</td>
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<tr>
<td>Vapor pressure @ 25°C</td>
<td>40 hPa</td>
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<tr>
<td>Vapor density (Air=1)</td>
<td>2.41</td>
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<tr>
<td>Evaporation Rate</td>
<td>Not determined</td>
</tr>
<tr>
<td>Water solubility @ 20°C</td>
<td>181 g/l</td>
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<tr>
<td>Solubility in other solvents</td>
<td>miscible with, Benzene, very soluble in, Ethanol, Diethyl ether, Acetone</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>0.60 (calculated)</td>
</tr>
<tr>
<td>Self-Accelerating decomposition temperature (SADT)</td>
<td>&gt;75 °C</td>
</tr>
<tr>
<td>Self-Accelerating polymerization temperature (SAPT)</td>
<td>&gt;50 °C</td>
</tr>
</tbody>
</table>

10. Stability and reactivity

Reactivity
Stable if protected from heat and exposure to air.

Conditions to avoid
Avoid any source of ignition. Avoid contact with heat, sparks, open flame, and static discharge.

Incompatible Materials
Keep away from:
- oxygen
- Oxidizing agents
- Reducing agents
- Acids
- Bases

Hazardous Combustion or Decomposition Products:
In the presence of sufficient oxygen, combustion may produce oxides of nitrogen and carbon dioxide. Nitrogen oxides can react with water to produce nitric acid. Combustion under oxygen starved conditions may produce numerous toxic products including carbon monoxide, cyanides and nitriles., Thermal decomposition products may include oxides of carbon.

Possibility of hazardous reactions
May form explosive peroxides, Polymerization can occur, Polymerization is a highly exothermic reaction and may generate sufficient heat to cause thermal decomposition and/or rupture containers.
11. Toxicological information

Potential health effects

Routes of exposure
Skin, eyes, inhalation, ingestion.

Immediate effects

Skin
May be fatal if absorbed through skin. May cause skin irritation. Symptoms of overexposure include: Central nervous system depression with headache, stupor, uncoordinated or strange behavior or unconsciousness. Crusting, scaling, weeping and itching of skin.

Eyes
Severely irritating to eyes. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

Inhalation
May be fatal if inhaled. Causes respiratory tract irritation. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior or unconsciousness. Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.

Ingestion
Harmful if swallowed. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior, or unconsciousness. Inflammation of mouth, throat, esophagus and/or stomach.

Target organ effects
Overexposure (prolonged or repeated exposure) may cause:
Central nervous system depression
Injury to the eyes
Irritation of the respiratory tract
Allergic reaction and local irritation of the skin

Medical conditions which may be aggravated by exposure:
Significant exposure to this chemical may adversely affect people with acute or chronic disease of the:
Respiratory Tract
Skin
Eyes
Digestive tract

Crotonaldehyde

Acute oral toxicity
LD50: 174 mg/kg- Harmful to toxic

Acute dermal toxicity
LD50: 26 mg/kg- toxic

Acute inhalation toxicity
LC50 (4h): 336 mg/m³- Highly toxic
Method
OECD 403

Skin corrosion/irritation
irritating
Species
rabbit
12. Ecological Information

**Crotonaldehyde**

**Acute fish toxicity**
Species: *Oncorhynchus mykiss* (rainbow trout)
Method: EPA OTS 797.1400
LC50: 0.65 mg/l (96h)

**Chronic fish toxicity**
Species: *Oryzias Latipes* (Medaka)
Method: OECD 210
NOEC: 0.0247 mg/l (41d)

**Acute daphnia toxicity**
Species: *Daphnia magna*
Method: EPA OTS 797.1300
EC50: 2 mg/l (48h)

**Toxicity to aquatic plants**
Species: *Pseudokirchneriella subcapitata*
Method: EPA OTS 797.1050
EC50: < 0.881 mg/l (96h)

**Toxicity to bacteria**
Species: *Pseudomonas putida*
Method: DIN 38412 T.8
EC10: 10.4 mg/l (18h)

**Biodegradation**
Readily biodegradable
(but failed the 10-day window criterion)
Method: EPS OTS 796.3200

**Skin Sensitization**
Species: mouse female

**Serious eye damage/eye irritation**
Species: Humans

**Carcinogenic effects**
No evidence of carcinogenicity

**in vitro Mutagenicity**
- Ames Test: positive - with and without metabolic activation - Method: OECD 471
- DNA Damage and Repair in hepatocytes: positive - without metabolic activation - Method: OECD 473

**in vivo Mutagenicity**
Sex-linked Recessive Lethal Test in *Drosophila Melanogaster*: negative and positive results - Method: OECD 477
Mammalian Erythrocyte Micronucleus Test in mice: negative - Method: OECD 474
Mammalian Bone Marrow Chromosome Aberration Test in mice: positive - Method: OECD 475
Rodent Dominant Lethal test in mice: positive - Method: OECD 478
Mammalian Spermatogonial Chromosome Aberration Test in mice: positive - Method: OECD 483

**Reproductive toxicity**
Species: rat
No toxicological effects to fertility or offspring
Routes of exposure: oral gavage

NOAEL: 10 mg/kg bw/day
12. Ecological Information

<table>
<thead>
<tr>
<th>Bioaccumulation</th>
<th>Does not bioaccumulate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other potential hazards</td>
<td>The substance does not meet the criteria for PBT / vPvB according to REACH, Annex XIII</td>
</tr>
</tbody>
</table>

13. Disposal considerations

Disposal considerations
Dispose of spilled material in accordance with state and local regulations for hazardous waste. Recommended methods are incineration or biological treatment at a federally or state-permitted disposal facility. Note that this information applies to the material as manufactured; processing, use, or contamination may make this information inappropriate, inaccurate, or incomplete.

Note that this handling and disposal information may also apply to empty containers, liners and rinsate. State or local regulations or restrictions are complex and may differ from federal regulations. This information is intended as an aid to proper handling and disposal; the final responsibility for handling and disposal is with the owner of the waste.

14. Transport information

US Department of Transportation

<table>
<thead>
<tr>
<th>UN/NA Number:</th>
<th>UN 1143</th>
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</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Crotonaldehyde</td>
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<tr>
<td>Hazard class</td>
<td>6.1</td>
</tr>
<tr>
<td>Subsidiary hazard</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>I</td>
</tr>
<tr>
<td>Reportable Quantity (RQ)</td>
<td>100 lb/45.4kg</td>
</tr>
<tr>
<td>Emergency Resp. Guide</td>
<td>131P</td>
</tr>
<tr>
<td>Poison Inhalation Hazard</td>
<td>Zone B</td>
</tr>
<tr>
<td>Marine pollutant</td>
<td>Yes</td>
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</table>

TDG

<table>
<thead>
<tr>
<th>UN/NA Number:</th>
<th>UN 1143</th>
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<tr>
<td>Proper Shipping Name</td>
<td>CROTONALDEHYDE</td>
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<td>Class:</td>
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<td>Subsidiary Risk:</td>
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<td>Packing Group:</td>
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Mexico Transport Information

<table>
<thead>
<tr>
<th>UN-No.</th>
<th>UN 1143</th>
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<tr>
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<td>Packing Group</td>
<td>I</td>
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</tbody>
</table>

ICAO/IATA

FORBIDDEN
Safety Data Sheet

Product Name: Crotonaldehyde
MSDS number: 80560
Revision Number: 8.04

IMDG
UN/ID No.: UN 1143
Proper Shipping Name: Crotonaldehyde
Hazard Class: 6.1
Subsidiary Risk: 3
Packing group: I
Marine pollutant: yes
EmS Code: F-E, S-D

Remarks
The product is not classified as self-reactive substance in class 4.1 according to UN-Transportation regulation (SADT >75°C). Special provision 386 taken into account.

15. Regulatory Information

US State Regulations
Chemicals associated with the product which are subject to the state right-to-know regulations are listed along with the applicable state(s):

Crotonaldehyde 4170-30-3
Pennsylvania Listed
New York Listed
New Jersey Listed
Louisiana Listed
Massachusetts Listed

U.S. FEDERAL REGULATIONS

Environmental Regulations:

Crotonaldehyde 4170-30-3
EPCRA Section 313 Listed
CERCLA Hazardous Substance Listed
Extremely Hazardous Substance Listed

SARA 311:
Acute health: Yes
Chronic health: Yes
Fire: Yes
Sudden release of pressure: No
Reactive: No

INTERNATIONAL REGULATIONS
International Inventories
Listed on the chemical inventories of the following countries or qualifies for an exemption:
Australia (AICS)
Canada (DSL)
China (IECSC)
Europe (EINECS)
Japan (ENCS)
Japan (ISHL)
Korea (KECI)
Philippines (PICCS)
United States (TSCA)

16. Other information

NFPA: Health: 4 Flammability: 3 Instability: 2
HMIS: Health: 4 Flammability: 3 Physical Hazard: 2

Prepared By
Product Stewardship Department
Celanese

Sources of key data used to compile the datasheet
Information contained in this safety data sheet is based on Celanese owned data and public sources deemed valid or acceptable. The absence of data elements required by ANSI or 1907/2006/EC indicates that no data meeting these requirements is available.

Other Information:
Observe national and local legal requirements
Changes against the previous version are marked by ***

For industrial use only. The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Celanese makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material may be released from gas, liquid, or solid materials made directly or indirectly from it. User has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards. Material safety data sheets are provided on the Internet by Celanese as a service to its customers. Possession of an Internet MSDS does not indicate that the possessor of the MSDS was a purchaser or user of the subject product.
Abbreviation and Acronym:
ADR = Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
CAS = Chemical Abstracts Service (division of the American Chemical Society)
CLP = Classification, Labelling and Packaging
DNEL = Derived No Effect Level
EINECS = European Inventory of Existing Commercial Chemical Substances
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
ICAO = International Civil Aviation Organization
IMDG = International Maritime Code for Dangerous Goods
LC50 = Lethal Concentration
LD50 = Lethal Dose
LOAEC = Low Observed Adverse Effect Concentration
LOAEL = Low Observed Adverse Effect Level
LOEL = Low Observed Effect Level
NOAEC = No Observed Adverse Effect Concentration
NOAEL = No Observed Adverse Effect Level
NOEC = No Observed Effect Concentration
NOEL = No Observed Effect Level
PBT = Persistent, Bioaccumulative and Toxic
PNEC = Predicted No Effect Concentration
RCR = Risk Characterization Ratio
RID = Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
STOT RE = Specific Target Organ Toxicity Repeated Exposure
STOT SE = Specific Target Organ Toxicity Single Exposure
STP = Sewage Treatment Plant
vPvB = very Persistent and very Bioaccumulative