ELECTRONIC
FLUOROCARBONS, LLC

# Safety Data Sheet

**Material Name: Cis-2-Butene**

## * * *Section 1 - IDENTIFICATION* * *

| | |
|---|---|
| **GHS product identifier** | Cis-2-Butene |
| **Chemical name** | Cis-2-Butene |
| **Other means of identification** | (Z)-2-Butene; cis-Butene; cis-Butylene; cis-1,2-Dimethylethylene; cis-2-Butene; (Z)-2-C4H8; Dimethylethylene; (2Z)-2-Butene; 2-Butene, cis-; butene-2,cis |
| **Product use** | Synthetic/Analytical chemistry. |
| **Synonym** | (Z)-2-Butene; cis-Butene; cis-Butylene; cis-1,2-Dimethylethylene; cis-2-Butene; (Z)-2-C4H8; Dimethylethylene; (2Z)-2-Butene; 2-Butene, cis-; butene-2,cis |
| **Supplier's details** | Electronic Fluorocarbons<br>3266 Bergey Road<br>Hatfield PA 19440 |
| **Emergency telephone #** | 1-800-535-5053 |
| **Outside the US (call collect)** | 1-352-323-3500 |

## * * *Section 2 - HAZARDS IDENTIFICATION* * *

| | |
|---|---|
| **OSHA/HCS status** | This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). |
| **Classification of the substance or mixture** | FLAMMABLE GASES - Category 1<br>GASES UNDER PRESSURE - Compressed gas |

**GHS label elements**

**Hazard pictograms**

| | |
|---|---|
| **Signal word** | Danger |
| **Hazard statements** | Extremely flammable gas.<br>May form explosive mixtures with air.<br>Contains gas under pressure; may explode if heated.<br>May displace oxygen and cause rapid suffocation. |

**Precautionary statements**

| | |
|---|---|
| **General** | Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution. |
| **Prevention** | Never Put cylinders into unventilated areas of passenger vehicles. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use and store only outdoors or in a well ventilated place. |
| **Response** | Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. |
| **Storage** | Protect from sunlight. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place. |

| | |
|---|---|
| **Disposal** | Not applicable. |
| **Hazards not otherwise classified** | In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation. |

## * * *Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS* * *

| | |
|---|---|
| **Substance/mixture** | Substance |
| **Chemical name** | Cis-2-Butene |
| **Other means of identification** | (Z)-2-Butene; cis-Butene; cis-Butylene; cis-1,2-Dimethylethylene; cis-2-Butene; (Z)-2-C4H8; Dimethylethylene; (2Z)-2-Butene; 2-Butene, cis-; butene-2,cis |

**CAS number/other identifiers**

| | |
|---|---|
| **CAS number** | 590-18-1 |
| **Product code** | 001010 |

| Ingredient name | % | CAS number |
|---|---|---|
| (Z)-but-2-ene | 100 | 590-18-1 |

**There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.**

**Occupational exposure limits, if available, are listed in Section 8.**

## * * *Section 4 - FIRST AID MEASURES* * *

**Description of necessary first aid measures**

| | |
|---|---|
| **Eye contact** | Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. |
| **Inhalation** | Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. |
| **Skin contact** | Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. |
| **Ingestion** | As this product is a gas, refer to the inhalation section. |

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

| | |
|---|---|
| **Eye contact** | Contact with rapidly expanding gas may cause burns or frostbite. |
| **Inhalation** | No known significant effects or critical hazards. |
| **Skin contact** | Contact with rapidly expanding gas may cause burns or frostbite. |
| **Frostbite** | Try to warm up the frozen tissues and seek medical attention. |
| **Ingestion** | As this product is a gas, refer to the inhalation section. |

**Over-exposure signs/symptoms**

| | |
|---|---|
| **Eye contact** | No specific data. |
| **Inhalation** | No specific data. |

| | |
|---|---|
| **Skin contact** | No specific data. |
| **Ingestion** | No specific data. |

**Indication of immediate medical attention and special treatment needed, if necessary**

| | |
|---|---|
| **Notes to physician** | Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. |
| **Specific treatments** | No specific treatment. |
| **Protection of first-aiders** | No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. |

**See toxicological information (Section 11)**

## * * *Section 5 - FIRE FIGHTING MEASURES* * *

**Extinguishing media**

| | |
|---|---|
| **Suitable extinguishing media** | Use an extinguishing agent suitable for the surrounding fire. |
| **Unsuitable extinguishing media** | None known. |

| | |
|---|---|
| **Specific hazards arising from the chemical** | Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. |
| **Hazardous thermal decomposition products** | Decomposition products may include the following materials:<br>carbon dioxide<br>carbon monoxide |
| **Special protective actions for fire-fighters** | Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so. |
| **Special protective equipment for fire-fighters** | Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. |

## ***Section 6 - ACCIDENTAL RELEASE MEASURES***

**Personal precautions, protective equipment and emergency procedures**

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|---|---|
| **For non-emergency personnel** | Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. |
| **For emergency responders** | If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel". |

| | |
|---|---|
| **Environmental precautions** | Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). |

**Methods and materials for containment and cleaning up**

| | |
|---|---|
| **Small spill** | Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. |
| **Large spill** | Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal. |

## * * *Section 7 - HANDLING AND STORAGE* * *

**Precautions for safe handling**

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|---|---|
| **Protective measures** | Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid contact with eyes, skin and clothing. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. |
| **Advice on general occupational hygiene** | Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures. |
| **Conditions for safe storage, including any incompatibilities** | Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). |

## * * *Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION* * *

**Control parameters**

**Occupational exposure limits**

| Ingredient name | Exposure limits |
|---|---|
| (Z)-but-2-ene | **ACGIH TLV (United States, 3/2012).**<br>TWA: 250 ppm 8 hours. |

| | |
|---|---|
| **Appropriate engineering controls** | Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment. |
| **Environmental exposure controls** | Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels. |

**Individual protection measures**

| | |
|---|---|
| **Hygiene measures** | Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location. |
| **Eye/face protection** | Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields. |
| **Skin protection** | |
| **Hand protection** | Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. |
| **Body protection** | Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves. |
| **Other skin protection** | Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. |
| **Respiratory protection** | Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. |

## * * *Section 9 - Physical and Chemical Properities* * *

| | |
|---|---|
| **Appearance** | |
| **Physical state** | Gas. [Compressed gas.] |
| **Color** | Colorless. |
| **Molecular weight** | 56.11 g/mole |
| **Molecular formula** | C4-H8 |
| **Boiling/condensation point** | 3.7°C (38.7°F) |
| **Melting/freezing point** | -138.9°C (-218°F) 162.4° |
| **Critical temperature** | C (324.3°F) |
| **Odor** | Not available. |
| **Odor threshold** | Not available. |
| **pH** | Not available. |
| **Flash point** | Not available. |
| **Burning time** | Not applicable. |
| **Burning rate** | Not applicable. |
| **Evaporation rate** | Not available. |
| **Flammability (solid, gas)** | Extremely flammable in the presence of the following materials or conditions: oxidizing materials |
| **Lower and upper explosive (flammable) limits** | Lower: 1.5<br>Upper: 9% |

| | |
|---|---|
| **Vapor pressure** | 13 (psig) |
| **Vapor density** | 1.9 (Air = 1) |
| **Specific Volume (ft $^3$/lb) Gas** | 6.6577 |
| **Density (lb/ft $^3$)** | 0.1502 |
| **Relative density** | Not applicable. |
| **Solubility** | Not available. |
| **Solubility in water** | Not available. |
| **Partition coefficient: n-octanol/water** | 2.33 |
| **Auto-ignition temperature** | 325°C (617°F) |
| **Decomposition temperature** | Not available. |
| **SADT** | Not available. |
| **Viscosity** | Not applicable. |

## * * *Section 10 - STABILITY AND REACTIVITY* * *

| | |
|---|---|
| **Reactivity** | No specific test data related to reactivity available for this product or its ingredients. |
| **Chemical stability** | The product is stable. |
| **Possibility of hazardous reactions** | Under normal conditions of storage and use, hazardous reactions will not occur. |
| **Conditions to avoid** | Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. |
| **Incompatibility with various substances** | Extremely reactive or incompatible with the following materials: oxidizing materials. |
| **Hazardous decomposition products** | Under normal conditions of storage and use, hazardous decomposition products should not be produced. |
| **Hazardous polymerization** | Under normal conditions of storage and use, hazardous polymerization will not occur. |

## * * *Section 11 - TOXICOLOGICAL INFORMATION* * *

**Information on toxicological effects**

**Acute toxicity**

Not available.

**Irritation/Corrosion**

Not available.

**Sensitization**

Not available.

**Mutagenicity**

Not available.

**Carcinogenicity**

Not available.

**Reproductive toxicity**
Not available.

**Teratogenicity**
Not available.

**Specific target organ toxicity (single exposure)**
Not available.

**Specific target organ toxicity (repeated exposure)**
Not available.

**Aspiration hazard**
Not available.

| | |
|---|---|
| **Information on the likely routes of exposure** | Not available. |

**Potential acute health effects**

| | |
|---|---|
| **Eye contact** | Contact with rapidly expanding gas may cause burns or frostbite. |
| **Inhalation** | No known significant effects or critical hazards. |
| **Skin contact** | Contact with rapidly expanding gas may cause burns or frostbite. |
| **Ingestion** | As this product is a gas, refer to the inhalation section. |

**Symptoms related to the physical, chemical and toxicological characteristics**

| | |
|---|---|
| **Eye contact** | No specific data. |
| **Inhalation** | No specific data. |
| **Skin contact** | No specific data. |
| **Ingestion** | No specific data. |

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

| | |
|---|---|
| **Potential immediate effects** | Not available. |
| **Potential delayed effects** | Not available. |

**Long term exposure**

| | |
|---|---|
| **Potential immediate effects** | Not available. |
| **Potential delayed effects** | Not available. |

**Potential chronic health effects**
Not available.

| | |
|---|---|
| **General** | No known significant effects or critical hazards. |
| **Carcinogenicity** | No known significant effects or critical hazards. |
| **Mutagenicity** | No known significant effects or critical hazards. |
| **Teratogenicity** | No known significant effects or critical hazards. |
| **Developmental effects** | No known significant effects or critical hazards. |
| **Fertility effects** | No known significant effects or critical hazards. |

**Numerical measures of toxicity**

**Acute toxicity estimates**

Not available.

## * * *Section 12 - ECOLOGICAL INFORMATION* * *

**Toxicity**

Not available.

**Persistence and degradability**

Not available.

**Bioaccumulative potential**

| Product/ingredient name | $LogP_{ow}$ | BCF | Potential |
|---|---|---|---|
| (Z)-but-2-ene | 2.33 | - | low |

**Mobility in soil**

**Soil/water partition coefficient ($K_{OC}$)** Not available.

**Other adverse effects** No known significant effects or critical hazards.

## * * *Section 13 - DISPOSAL CONSIDERATIONS* * *

**Disposal methods** The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

## * * *Section 14 - Transport Information* * *

| | DOT | TDG | Mexico | IMDG | IATA |
|---|---|---|---|---|---|
| **UN number** | UN1012 | UN1012 | UN1012 | UN1012 | UN1012 |
| **UN proper shipping name** | Butylene | Butylene | Butylene | Butylene | Butylene |
| **Transport hazard class(es)** | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |
| **Packing group** | - | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| **Environment** | No. | No. | No. | No. | No. |
| **Additional information** | - | **Explosive Limit and Limited Quantity Index**<br>0.125<br><br>**ERAP Index**<br>3000<br><br>**Passenger Carrying Ship Index**<br>Forbidden<br><br>**Passenger Carrying Road or Rail Index**<br>Forbidden | - | - | - |

**"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."**

**Special precautions for user** — **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code** — Not available.

## * * *Section 15 - REGULATORY INFORMATION* * *

**U.S. Federal regulations**

**TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)**

**Clean Air Act (CAA) 112 regulated flammable substances**: Cis-2-Butene **:** Not listed

**Clean Air Act Section 602 Class I Substances** — Not listed

**Clean Air Act Section 602 Class II Substances** — Not listed

**DEA List I Chemicals (Precursor Chemicals)** — Not listed

**DEA List II Chemicals (Essential Chemicals)** — Not listed

**SARA 302/304**

**Composition/information on ingredients**

No products were found.

**SARA 304 RQ** — Not applicable.

**SARA 311/312**

**Classification** — Fire hazard
Sudden release of pressure

**Composition/information on ingredients**

| Name | % | Fire hazard | Sudden release of pressure | Reactive | Immediate (acute) health hazard | Delayed (chronic) health hazard |
|---|---|---|---|---|---|---|
| (Z)-but-2-ene | 100 | Yes. | Yes. | No. | No. | No. |

**State regulations**

**Massachusetts** This material is listed.

**New York New Jersey** This material is not listed.

**Pennsylvania** This material is listed.

**Canada inventory** This material is listed or exempted.

**International regulations**

**International lists**

**Australia inventory (AICS)**: This material is listed or exempted.
**China inventory (IECSC)**: This material is listed or exempted.
**Japan inventory**: This material is listed or exempted.
**Korea inventory**: This material is listed or exempted.
**Malaysia Inventory (EHS Register)**: Not determined.
**New Zealand Inventory of Chemicals (NZIoC)**: This material is listed or exempted.
**Philippines inventory (PICCS)**: This material is listed or exempted.
**Taiwan inventory (CSNN)**: Not determined.

**Chemical Weapons Convention List Schedule I Chemicals** Not listed

**Chemical Weapons Convention List Schedule II Chemicals** Not listed

**Chemical Weapons Convention List Schedule III Chemicals** Not listed

**Canada**

**WHMIS (Canada)**

Class A: Compressed gas.
Class B-1: Flammable gas.

**CEPA Toxic substances**: This material is not listed.
**Canadian ARET**: This material is not listed.
**Canadian NPRI**: This material is listed.
**Alberta Designated Substances**: This material is not listed.
**Ontario Designated Substances**: This material is not listed.
**Quebec Designated Substances**: This material is not listed.

## * * *Section 16 - OTHER INFORMATION* * *

**Canada Label requirements** :Class A: Compressed gas.
Class B-1: Flammable gas.

**NFPA Ratings**
Health: 1 Fire: 4 Reactivity: 0
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

**Key / Legend**
ACGIH - American Conference of Governmental Industrial Hygienists; ADR - European Road Transport; AU - Australia; BOD - Biochemical Oxygen Demand; C - Celsius; CA - Canada; CAS - Chemical Abstracts Service; CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act; CN - China; CPR - Controlled Products Regulations; DFG - Deutsche Forschungsgemeinschaft; DOT - Department of Transportation; DSL - Domestic Substances List; EEC - European Economic Community; EINECS - European Inventory of Existing Commercial Chemical Substances; EPA - Environmental Protection Agency; EU - European Union; F - Fahrenheit; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; ICAO - International Civil Aviation Organization; IDL - Ingredient Disclosure List; IDLH - Immediately Dangerous to Life and Health; IMDG - International Maritime Dangerous Goods; JP - Japan; Kow - Octanol/water partition coefficient; KR - Korea; LEL - Lower Explosive Limit; LOLI - List Of LIsts™ - ChemADVISOR's Regulatory Database; MAK - Maximum Concentration Value in the Workplace; MEL - Maximum Exposure Limits; NFPA - National Fire Protection Agency; NIOSH - National Institute for Occupational Safety and Health; NJTSR - New Jersey Trade Secret Registry; NTP - National Toxicology Program; NZ - New Zealand; OSHA - Occupational Safety and Health Administration; PH - Philippines; RCRA - Resource Conservation and Recovery Act; RID - European Rail Transport; RTECS - Registry of Toxic Effects of Chemical Substances®; SARA - Superfund Amendments and Reauthorization Act; STEL - Short-term Exposure Limit; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act; TWA - Time Weighted Average; UEL - Upper Explosive Limit; US - United States

**Other Information**
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