1 – Identification

GHS Product identifier: **1,2-DICHLOROETHANE**

Recommended use of the chemical and restrictions on use: Industrial use.

Supplier: **BRASKEM S/A.**

Address: Av. Assis Chateaubriand, 5260. Pontal da Barra.
CEP: 57010-900
Maceió/AL – Brasil

Phone number: (82) 3177 5211

Emergency phone number: 08000 82 1660 ou (82) 3326 6828

2 – Hazard identification

Classification of the substance (*):

Hazard Classes	Category
Flammable liquids	2
Acute toxicity - Oral	4
Skin irritation	2
Eye irritation	2A
Carcinogenicity	1
Specific target organ toxicity (Single exposure)	3
Specific target organ toxicity (Repeated exposure)	2

GHS label elements, including precautionary statements (**):

Pictograms:

Signal word: Danger

Hazard statements:

H225: Highly flammable liquid and vapour
H302: Harmful if swallowed
H315: Causes skin irritation
H319: Causes serious eye irritation
H350: May cause cancer
H335: May cause respiratory irritation
H336: May cause drowsiness or dizziness
H373: May cause damage to organs (liver, lings, and kidneys) through prolonged or repeated exposure

Precautionary statements:

Prevention:
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P233: Keep container tightly closed.

P240: Ground and bond container and receiving equipment.

P241: Use explosion-proof electrical, ventilating and lighting equipment.

P242: Use non-sparking tools.

P243: Take action to prevent static discharges.

P260: Do not breathe fume, gas, vapours, and spray.

P264: Wash hands thoroughly after handling.

P270: Do not eat, drink or smoke when using this product.

P271: Use only outdoors or in a well-ventilated area.

P280: Wear protective gloves, protective clothing, eye protection, face protection.

Response:

P314: Get medical advice/attention if you feel unwell.

P330: Rinse mouth.

P302 + P352: IF ON SKIN: Wash with plenty water.

P301 + P312: IF SWALLOWED: Call a POISON CENTER if you feel unwell.

P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.

P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P308 + P313: If exposed or concerned: Get medical attention.

P332 + P313: If skin irritation occurs: Get medical attention.

P337 + P313: If eye irritation persists: Get medical attention.

P362 + P364: Take off contaminated clothing and wash it before reuse.

P370 + P378: In case of fire: Use carbon dioxide (CO_2), dry chemical, water spray or alcohol-resistant foam to extinguish.

Storage:

P405: Store locked up.

P403 + P233: Store in a well-ventilated place. Keep container tightly closed.

P403 + P235: Store in a well-ventilated place. Keep cool.

Disposal:

P501: Dispose of contents and/or container should be in accordance with local regulations.

(*) GHS 2011 (Globally harmonized system of classification and labeling of chemicals 2011).

Other hazards which do not result in classification: It is not available.

3 – Composition/information on ingredients

SUBSTANCE

Common name of the substance:	1,2-dichloroethane.
Synonyms:	Ethylene dichloride; EDC.
CAS number:	107-06-2
Impurities and stabilizing additives which are themselves classified and which contribute to the classification of the substance:	It is not available.

4 – First-aid measures

Inhalation: Take the victim to fresh air. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Seek medical attention immediately and take the product container or label with you.

Skin contact: Take off contaminated clothes and shoes. Wash affected area with soap or mild detergent and large amounts of water until no evidence of the chemical remains, avoiding the spread of the material to unaffected skin areas. Seek immediate medical attention and take the product container or label with you.

Eye contact: First, check the victim for contact lenses and remove them if present. Wash exposed eyes with abundant water at room temperature for at least 15 minutes, lifting the eyelid while washing them. Seek medical attention immediately and take the product container or label with you.

Ingestion: DO NOT INDUCE VOMITING. Wash the mouth with plenty of water. In case of spontaneous vomiting, keep the head below the level of the hips. If the individual is lying down, keep him/her in lateral position to avoid aspiration of the gastric content. Seek immediate medical attention and take the product container or label with you.

Most important symptoms/effects, acute and delayed: If in contact with skin, the product may cause irritation. In contact with the eyes, the product may cause severe irritation and lacrimation. Inhalation of high concentration vapors or ingestion of 1,2-dichloroethane may cause dyspnea, irritation in the respiratory and gastrointestinal tracts with nausea, vomiting, abdominal pain, diarrhea and hemorrhage. It can also cause central nervous system depression, resulting in dizziness, headache, incoordination, somnolence, unconsciousness and coma. In severe cases can cause damage to the lungs, liver, kidney, and adrenal glands. Ingestion of large amounts is harmful. The substance is a potential occupational carcinogen.

Notes to an attending physician: Symptomatic treatment. There is no specific antidote. Perform topical therapy in case of burns.

5 – Fire-fighting measures

Suitable extinguishing media: HIGHLY FLAMMABLE: It will be easily ignited by heat, sparks or flames. CAUTION: This product have a very low flash point: use of water spray when fighting fire may be inefficient.

Small fire: carbon dioxide (CO_2), dry chemical, water spray or alcohol-resistant foam.

Large fire: Water spray, fog or alcohol-resistant foam. Use water spray or fog; do not use straight streams.

Dike fire-control water for later disposal; do not scatter the material.

Specific hazards arising from the chemical:	The vapour is heavier than air and it will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapors may travel to source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. Fire will produce irritating, corrosive and/or toxic gases of hydrogen chloride, phosgene, acetylene and vinyl chloride.
Special protective actions for fire-fighters:	Keep unauthorized personnel away. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. ALWAYS stay away from tanks engulfed in fire. Cool containers with flooding quantities of water until well after fire is out. Do not get water inside containers. For massive fire, use unmanned hose holders or monitor nozzles. Dike fire-control water for later disposal; do not scatter the material. Wear full protective clothing and self-contained breathing apparatus. Structural firefighters' protective clothing provides limited protection in fire situations only; it is not effective in spill situations where direct contact with the substance is possible. During the fire extinguishment, avoid contact with the substance; if it is not possible, wear chemical protective clothing.

6 – Accidental release measures

Personal precautions, protective equipment and emergency procedures:

For non-emergency personnel:	HIGHLY FLAMMABLE. Use personal protective equipment (PPE). Eliminate all ignition sources. Avoid contact with sparks or flames. Do not smoke. Ventilate enclosed areas before entering. Avoid contact of the product with the skin, eyes and mucous membranes. Do not handle broken packaging unless wearing personal protective equipment. Do not touch or walk through spilled material. Stay upwind. Vapors may cause dizziness or suffocation.
For emergency responders:	HIGHLY FLAMMABLE: The product will be easily ignited by heat, sparks or flames. Use suitable PPE. Keep unauthorized personnel away. As an immediate precautionary measure, isolate spill or leak area in all directions for at least 50 m (150 ft). Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Wear positive pressure self-contained breathing apparatus (SCBA). All equipment used when handling the product must be grounded. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Water spray may reduce vapor; but may not prevent ignition in closed spaces. Avoid allowing water runoff to contact spilled material. Do not touch or walk through spilled material.
Environmental precautions:	Prevent environmental pollution. Do not allow dispersed product to enter in sewers or watercourses. If product enters in the watercourses, immediately interrupt the human or animal use and contact local environmental agency or the company emergency center, since the measures to be taken depend on a variety of factors such as the accident proportion, the watercourse characteristics and the amount of spilled product.
Methods and materials for containment and cleaning up:	Use PPE. Stop leak if you can do it without risk. Paved areas: cover with dry earth, dry sand or other non-combustible material. Use clean non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal. Wash the area with soap and water, taking preventive measures to avoid environmental contamination by wastewater. Soil: Remove contaminated soil layers until achieving uncontaminated soil and conduct in accordance with the information above. For all cases mentioned above, spilled product can not be used further and must be disposed of. Contact Braskem S/A for return and disposal.

7 – Handling and storage

Precautions for safe handling:

Use PPE. Do not handle product without the recommended PPE or if they are damaged. Avoid the contact of the product with skin, eyes and mucous membranes. Ensure good ventilation in the work area. Use only closed systems, ventilation, and explosion-proof electrical equipment. The usual precautions for the handling of chemicals must be observed. Do not reuse the empty package. Do not wash package in lakes, rivers and watercourses. Do not eat, drink or smoke while handling the product.

Conditions for safe storage, including any incompatibilities:

Store the product in the original package, tightly closed, at room temperature, protected from sunlight. Store away from food, feed, beverage and incompatible materials. Lock the place, preventing the access of unauthorized people. There must always be adequate packing available to cover and protect broken or cracked packages or to collect leaked products. Observe the disposals of the state and local legislation.

Recommended packaging material: steel, stainless steel 304, stainless steel 320.

8 – Exposure controls/personal protection

Control parameters

Occupational exposure limit values:

ACGIH:	10 ppm* (ACGIH, 2013).
NIOSH REL:	Ca**; TWA 1 ppm (4 mg/m^3); ST 2 ppm (8 mg/m^3) (NIOSH, 2011).
NIOSH IDLH:	Ca**; 50 ppm (NIOSH, 2011).
OSHA PEL:	TWA 50 ppm; C 100 ppm; 200 ppm [5-minute maximum peak in any 3 hours] (OSHA, 2004).

* Basis: liver damage; nausea.

** Potential occupational carcinogen.

Biological exposure indices:

There are no biological exposure indices established by ACGIH (2013).

Appropriate engineering controls:

Maintain air concentrations of 1,2-dichloroethane below occupational exposure standards. Keep the level of oxygen above 19.5% in the work area. Provide local ventilation at workplace. Provide exhaust ventilation where processes require. Use only closed systems, ventilation, and explosion-proof electrical equipment. Provide emergency shower and eye washer near the workplace.

Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection:

Wide vision safety goggles.

Skin protection:

Aprons, protective clothes, rubber boots, and impermeable gloves. Suitable materials include: Polyvinylalcohol (PVAL), Viton®, Viton®/butyl rubber, Barrier® (PE/PA/PE), Silver Shield/4H® (PE/EVAL/PE), Tychem® CPF 3, Tychem® BR/LV, Tychem® Responder, Tychem® TK.

The following materials should NOT be used: butyl rubber, natural rubber, neoprene rubber, nitrile rubber, polyethylene (PE), polyvinylchloride (PVC).

Respiratory protection:

For escaping, use air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister or appropriate escape-type, self-contained breathing apparatus escape.

Use supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus.

Use respirators if levels of oxygen are lower than 19.5%.

Thermal hazards: It is not available.

9 – Physical and chemical properties

Appearance:	Uncolored liquid.
Odour:	Chloroform-like (HSDB, 2010; NIOSH, 2011).
Odour threshold:	It is not available.
pH:	It is not available.
Melting point/freezing point:	-31.54°F/ -35.3°C (HSDB, 2010).
Initial boiling point and boiling range:	182.48°F/ 83.6°C.
Flash point:	55.4°F/13°C [closed cup] (HSDB, 2010).
Evaporation Rate:	3.3 (ether=1) (CETESB, 2003).
Flammability (solid, gas):	It is not applicable.
Upper/lower flammability or explosive limits:	Upper: 16%; lower: 6.2% (NIOSH, 2011).
Vapour pressure:	8812.6 Pa (66.1 mmHg) at 68°F/20°C.
Vapour density:	3.42 (air=1) (IPCS, 2005).
Relative density:	1.2351 at 20°C/68°F (IPCS, 2005).
Solubility:	Miscible in water (8 kg/m³).
Partition coefficient: n-octanol/water:	Log K_{OW}: 1.48 (HSDB, 2010; U.S. EPA, 2000).
Auto-ignition temperature:	775.4°F/413°C (HSDB, 2010; IPCS, 2005).
Decomposition temperature:	It is not available.
Viscosity:	0.84 x 10^{-3} Pa.s (0.84 cP) at 68°F/20°C (HSDB, 2010).
Corrosivity:	It is corrosive to iron and other metals when in contact with water (HSDB, 2010).

10 – Stability and reactivity

Reactivity:	None, when properly stored and handled. Reacts with metals and alkaline materials.
Chemical stability:	It is stable at room temperature in closed containers under suitable storage and handling conditions. Darkens when exposed to light or air. As a result of flow or agitation of substance, electrostatic charges may be generated due to low conductivity (IPCS, 2005; THE UNIVERSITY OF AKRON, 2010; WHO, 1998).
Possibility of hazardous reactions:	The substance reacts violently with nitrogen tetroxid, dimethilamine propilamine ou liquid ammonium. Vigorous reactions occur when there are mixture of DCE, with propylene dichloride and o-dichlorobenzene in contact with aluminum (UNEP; FAO, 2001). Reacts violently with aluminum, alkali metals, alkali amides, ammonia, bases, and strong oxidants. Attacks many metals in presence of water. Attacks plastic (IPCS, 1995).
Conditions to avoid:	Sources of ignition, heat, air, water and contact with incompatible substances.
Incompatible materials:	Strong oxidizers, reducing agents, caustics; chemically-active metals such as magnesium or aluminum powder, organic peroxides, alkali and alkali earth metals, nitric acid, nitrogen tetraoxide, ammonia, and dimethylaminopropylamine (THE UNIVERSITY OF AKRON, 2010).
Hazardous decomposition products:	It is not available.

11 – Toxicological information

Acute toxicity:

LD_{50} oral (rats): 500 mg/kg b.w. (RTECS, 2009).

LD_{50} dermal (rabbits): 2800 mg/kg b.w. (RTECS, 2009).

LC_{50} inhalation (rats): approx. 8000 mg/m³/4h (8.0 mg/L/4h) (OECD, 2002).

Skin corrosion/irritation:

When applied on the skin of experimental animals, the substance caused microscopic alterations and moderate edema (UNEP; FAO, 2001). The substance cause moderate skin irritation in rabbits (OECD, 2002).

Serious eye damage/irritation:

Contact with the liquid or with high concentrations of vapor causes immediate discomfort with conjunctival hyperemia and slight corneal injury (HSDB, 2010). Instilled DCE produced no or only slight to transiently moderate irritation to eyes (OECD, 2002).

Respiratory or skin sensitization:

There are no data available in literature regarding the respiratory or skin sensitization potential of 1,2-dichloroethane.

Germ cell mutagenicity:

Mutagenic and genotoxic effects were observed in bacterial and mammalian *in vitro* test systems. However, there is no experimental evidence for 1,2-dichloroethane to cause mutations in germ cells (OECD, 2002).

Carcinogenicity:

In studies conducted with rats and mice, 1,2-dichloroethane increased the incidence of tumours at various sites including the liver, lung and mammary gland. There is sufficient evidence in experimental animals for the carcinogenicity of 1,2-dichloroethane. Although there is inadequate evidence in humans for the carcinogenicity of 1,2-dichloroethane, it is considered a possible carcinogenic to humans (IARC, 1999; NTP, 2011).

Reproductive toxicity:

In studies conducted with rats and mice there were no evidences that 1,2-dichloroethane affects development or reproduction at doses below those that are maternally toxic. No teratogenic effect was seen in rats, rabbits or mice (ATSDR, 2001; IARC, 1999; OECD, 2002).

Specific target organ toxicity - single exposure:

In humans it is reported that 1,2-dichloroethane is a central nervous depressant and effects are manifested by unspecific symptoms such as nausea, vomiting, headache, lightheadedness and weakness to stupor, dysequilibrium, coma, and respiratory arrest (OECD, 2002).

Specific target organ toxicity - repeated exposure:

Regardless of the route of administration chosen, signs of toxicity in rats, mice, guinea pigs, and rabbits after administration of high doses are described by liver damage (fatty degeneration and haemorrhagic necrosis, increased hepatic enzyme activities and reduction of glutathione levels), kidney damage (congestion, hemorrhage, necrosis, interstitial oedema, dilatation of renal tubules, fatty degeneration of the tubular epithelium and hypertrophy of tubular cells) and damage to the lungs (congestion, hemorrhage, edema, fluid in the pleural and peritoneal space) (OECD, 2002).

Aspiration hazard:

There are no data available in literature regarding the aspiration hazard of 1,2-dichloroethane.

12 – Ecological information

Ecotoxicity

Toxicity on algae: EC_{50} (72h): 189 mg/L (*Scenedesmus subspicatus*) (OECD, 2002).

Toxicity on crustacea: EC_{50} (48h): 155 - 183 mg/L (*Daphnia magna*) (OECD, 2002).

Toxicity on fishes: LC_{50} (96h): 116 mg/L (*Pimephales promelas*) (OECD, 2002).

Persistence and degradability:

Biodegradation is not expected to occur under either aerobic or anaerobic conditions. The photo-oxidation of ethylene dichloride in air is expected to be a slow process (UNEP; FAO, 2001). In the air, it breaks down by reacting with other compounds formed by the sunlight, but it

can take up to five months. Since it stays in the air for a while, the wind may carry it over large distances (ATSDR, 2001). Biodegradable after adaptation and methane enrichment (OECD, 2002).

Bioaccumulative potential: A BCF of 2 was measured for 1,2-dichloroethane. This BCF suggests bioconcentration in aquatic organisms is low (HSDB, 2010; OECD, 2002).

Mobility in soil: Based on both the water solubility and high volatility, adsorption to soil and sediments is not expected, which is supported by an experimentally determined K_{OC}-value of 33 for silt loam. The substance rapidly percolates through sandy soil. 1,2-dichloroethane is highly mobile in soil and it is expected to leach into groundwater (ATSDR, 2001; OECD, 2002).

Other adverse effects: Small amounts of 1,2-dichloroethane are transported to the stratosphere, where photolysis may produce chlorine radicals, which may in turn react with ozone. However, it is not expected to contribute to ozone depletion (IPCS, 1998).

13 – Disposal considerations

Disposal methods

Mixture residues: If this product becomes improper for use or in disuse, contact the company Braskem S/A for devolution and final destination. Do not discard in sewers or watercourses. Disposal should be in accordance with local, state or national legislation.

Contaminated containers: Do not use the empty package. The inadequate destination of the empty package and product waste in the environment causes soil, water and air contamination, harming fauna, flora and the population's health.

14 – Transport information

Land (Brazil):

Brazilian Legislation: Decreto n°. 96.044 de 18 de maio de 1988. Resolução n° 420 de 12 de fevereiro de 2004.

Sea:

INTERNATIONAL MARITIME ORGANIZATION. International Maritime Dangerous Goods Code (IMDG Code, 2012).

Air:

INTERNATIONAL AIR TRANSPORT ASSOCIATION. Dangerous Goods Regulation. 54th Edition (IATA, 2013).

Classification for land transportation (Brazil):

UN Number:	1184
Proper shipping name:	DICLORETO DE ETILENO
Class or division:	3
Subsidiary risk:	6.1
Risk number:	336
Packing group:	II

Classification for sea transportation:

UN Number:	1184
Proper shipping name:	ETHYLENE DICHLORIDE
Class or division:	3
Subsidiary risk:	6.1
Packing group:	II
Marine pollutant:	---
EmS:	F-E, S-D

Classification for air transportation:	
UN Number:	UN 1184
Proper shipping name:	Ethylene dichloride
Class or division:	3
Subsidiary risk:	6.1
Packing group:	II

15 – Regulatory information

This Safety Data Sheet (SDS) was prepared in accordance to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS) – 5th revised edition (2013).

16 – Other information

The data herein are based on current knowledge and experience. The purpose of this Safety Data Sheet is to describe the products in terms of their safety requirements. The data do not replace any guarantee regarding the products properties. It is the user's responsibility to ensure that his/her activities comply with Federal, State and Local laws.

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Abbreviations:

ACGIH - American Conference of Governmental Industrial Hygienists.

BCF - Bioconcentration factor

b.w. - Body weight.

C - *Ceiling.*

CAS - Chemical Abstract Service.

EC_{50} - Concentration of test substance, which results in a 50% reduction in either biomass rate relative to the control.

EVAL - Ethylene vinyl alcohol.

IDLH - Immediately Dangerous to Life or Health Concentrations.

LC_{50} - Concentration of a test substance in air or of a chemical in water, which causes the death of 50% (one-half) of a group of test animals (50% lethal concentration).

LD_{50} - Amount of a test substance, which causes the death of 50% (one-half) of a group of test animals.

NIOSH - National Institute for Occupational Safety and Health.

NIOSH REL - Recommended Exposure Limit established by NIOSH.

OSHA - Occupational Safety and Health Administration.

OSHA PEL - Permissible Exposure Limit established by OSHA.

PA - Polyamide.

PE - Polyethylene.

PPE - Personal protective equipment.

PVC - Polyvinyl chloride.

ST - Short-term exposure limit.

TWA - Time weighted average.