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1. Chemical Product & Company Identification

A. Product Name: Ethylene

B. Intended Use: Raw materials for the production of synthetic resin and chemicals of basic petrochemicals (Polyethylene, ethylene oxide)

Restrictions on use: Do not use for purposes other than those recommended

C. Manufacturer/Supplier:

1) Manufacturer:

Hanwha TotalEnergies Co.,Ltd			
103, Dokgot2-Ro, Daesan-Eup, Seosan-Si, Chungnam, 31900, Korea			
T e l e p h o n e	82-41-660-6415	F a x	82-41-660-6637

2) Supplier:

Hanwha TotalEnergies Co.,Ltd			
17~20F Hanwha Finance Plaza, 92, Sejong-daero, Jung-gu, Seoul 04525, Korea			
T e l e p h o n e	82-2-3415-9374	F a x	82-2-3415-9390

3) Competitive person:

Departments	Safety & Health Planning Team		
T e l e p h o n e	82-41-660-6390,6382	F a x	82-41-660-6348

2. Hazard Identification

According to UN GHS 4th edition

A. Hazard Category:

1) Physicochemical Hazards

- Flammable gases: Category 1
- Gases under pressure: Compressed gas


2) Health Hazards: Not Classified

3) Environmental Hazards: Not Classified

B. Precautionary Statement(s) & Warning Label

1) Symbol:



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2) Signal Word: Danger

3) Hazard Statement(s):

H220 Extremely flammable gas

H280 Contains gas under pressure; may explode if heated.

4) Precautionary Statement(s):

■ Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

■ Response

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 Eliminate all ignition sources if safe to do so.

■ Storage

P403 Store in a well-ventilated place.

P410+P403 Protect from sunlight. Store in a well-ventilated place.

■ Disposal : Not applicable

C. Other hazards

NFPA ratings: Health=0, Flammability=4, Instability=0, Special=-

3. Composition / Information on ingredients

Chemical Name	Other Name	CAS No. or EC No.	(%)
Ethylene	Ethene; Acetene	74-85-1 (EC No. 200-815-3)	100


4. First Aid Measures

A. Eye Contact:

- Call emergency medical service.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

B. Skin Contact:

- In case of frostbite, thaw frosted parts with lukewarm water(105-115 F , 41-46°C).
- If warm water is not available, gently wrap the affected area.
- Call emergency medical service.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at

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least 20 minutes.

- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.

C. Inhalation:

- Move victim to fresh air.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Keep victim warm and quiet.

D. Ingestion:

- Call emergency medical service.

E. Likely Acute or Delayed Symptoms/Effects:

1) Inhalation

- Short term exposure: Nausea, vomiting, difficulty breathing, irregular heartbeat, drowsiness, dizziness, disorientation, emotional disturbances, loss of coordination, bluish skin color, suffocation, convulsions, unconsciousness, coma
- Long term exposure: Not available

2) Skin contact

- Short term exposure: Frostbite
- Long term exposure: Not available

3) Eye contact

- Short term exposure: Frostbite
- Long term exposure: Not available

4) Ingestion

- Short term exposure: It does not seem to cause the gas intake.
- Long term exposure: Not available


F. Emergency measure / Notes to physician

- If inhaled, consider the supply of oxygen.

5. Fire Fighting Measures

A. Extinguishing (and unsuitable) media:

- 1) Suitable extinguishing media: Carbon dioxide, dry chemical powder, alcohol foam, water spray
- 2) Unsuitable extinguishing media: Not available
- 3) Unusual fire(big fire): Do use extinguishing media with water spray or fog.

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B. Unusual fire & Explosion hazard:

1) Hazardous combustion product:


- Thermal decomposition or combustion products: Carbon oxides
- Fire will produce irritating, corrosive and/or toxic gases.


2) Fire & Explosion hazard:

- Unstable explosive
- Extremely flammable gas
- Explosion risk in case of fire.
- Containers may explode when heated.
- Will be easily ignited by heat, sparks or flames.
- Vapors may travel to source of ignition and flash back.
- Cylinders exposed to fire may release flammable gas.
- Some of these materials, if spilled, may leave a flammable residue after evaporation
- By flow or agitation of material may cause static electricity which could result in ignition or explosion.

C. Special fire fighting procedure / protection of firefighters:

- DO not fight fire when fire reaches explosives.
- Evacuate area.
- Eliminate all ignition sources if safe to do so.
- Evacuate area and fight fire from a safe distance.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Ruptured cylinders may rocket.
- May explode by fire and throw fragments 1,600 meters (1 mile) or more
- Move containers from fire area if you can do it without risk.
- TIRE or VEHICLE Fire; Use plenty of water Flood it! If water is not available, use CO2, dry chemical or dirt.
- TIRE or VEHICLE Fire; If possible, and without risk, use unmanned hose holders or monitor nozzles from maximum distance to prevent fire from spreading to cargo area.
- TIRE or VEHICLE Fire; Pay special attention to tire fires as re-ignition may occur.
- Fire involving Tanks; Do not direct water at source of leak or safety devices; icing may occur.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

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<ul style="list-style-type: none">- Fire involving Tanks; Always stay away from tanks engulfed in fire.- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.- Damaged cylinders should be handled only by specialists.- CARGO Fire; Stop all traffic and clear the area for at least 1600 meters (1 mile) in all directions and let burn.- CARGO Fire; DO NOT fight fire when fire reaches cargo! Cargo may EXPLODE!- Do not move cargo or vehicle if cargo has been exposed to fire.- Use extinguishing agent suitable for type of surrounding fire.			
<div>6. Accidental Release Measures</div> <p>A. Personal precautions:</p> <ul style="list-style-type: none">- Leaking gas fire: Do not extinguish, unless leak can be stopped safely.- Evacuate people from the surrounding area.- The very fine particles may cause a fire or explosion, eliminate all ignition sources.- If possible, turn leaking containers so that gas escapes rather than liquid.- Isolate area until gas has dispersed.- Do not touch or walk through spilled material.- Do not direct water at spill or source of leak.- Eliminate all ignition sources.- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.- All equipment used when handling the product must be grounded.- Allow substance to disperse- Stop leak if you can do it without risk.- Some of these materials, if spilled, may leave a flammable residue after evaporation- Do not operate the transceiver within 100m electric detonator.- Do not clean and processed without the supervision of experts.- Please note that there are materials and conditions to avoid.- Ventilate closed spaces before entering.- Use water to reduce vapors. <p>B. Environmental precautions:</p> <ul style="list-style-type: none">- Prevent entry into waterways, sewers, basements or confined areas.- Prevent spreading of vapors through sewers, ventilation systems and confined areas. <p>C. Spill cleanup methods:</p> <ul style="list-style-type: none">- Dike and collect water used to fight fire.			

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7. Handling and Storage

A. Handling:

- Do not handle until all safety precautions have been read and understood.
- Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition.
- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- All equipment used when handling the product must be grounded.
- Please note that there are materials and conditions to avoid.
- Handling only authorized person.
- Avoid direct contact with body.
- Use suitable and approved safe equipment.
- Dealing only with a well-ventilated place.


B. Storage:

- Protect from sunlight. Keep container in a cool, well-ventilated area.
- Don't store in metal containers.
- Store in outside or isolated place
- Do not apply any physical shock to container.
- Keep the store in fireproof structures.
- Ground and equipotential ground is required.
- Please pay attention to incompatibilities materials and conditions to avoid.
- Keep away from heat/sparks/open flames/hot surfaces/ignition sources. - No smoking.
- Store in accordance with the regulations.
- Containers can build up pressure if exposed to heat (fire).
- Store in a closed container.

8. Exposure Controls / Personal Protection

A. Exposure limit value:

- 1) ACGIH regulation: TWA =200ppm
- 2) OSHA regulation: Not available
- 3) NIOSH regulation: Not available
- 4) Biological exposure index: Not available
- 5) EU regulation:
 - Belgium: TWA=200ppm(=233mg/m³)
 - Finland: TWA=200ppm
 - Ireland: TWA=200ppm, STEL=600ppm(calculated)

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6) Other:

- Colombia: TWA=200ppm
- Dominican Republic: TWA=200ppm
- Indonesia: TWA=200ppm

B. Engineering control:

- Provide local exhaust ventilation system or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
- If exposure limits have not been established, maintain airborne levels to an acceptable level.
- Keep an explosion-proof material unit to a ventilator when there is a risk of explosive concentrations.

C. Personal protective equipment

1) Respiratory protection:

- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.

2) Eye protection:

- Wear enclosed safety goggles to protect from gaseous state organic material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.
- Do not wear contact lenses.

3) Hand protection:


- Wear cold-insulating gloves.
- Wear appropriate protective gloves by considering physical and chemical properties of chemicals.

4) Skin / Body protection:

- Wear suitable protective clothes and arctic clothes in a liquid state.
- Wear fire/flame resistant/retardant clothing.
- Wear appropriate protective clothing by considering physical and chemical properties of chemicals.

9. Physical and Chemical Properties

- A. Appearance(physical state, color etc.): Colorless compressed gas
- B. Odor: Sweet Odor
- C. Odor Threshold: 260ppm
- D. pH: Not applicable
- E. Melting point/Freezing point: -169.2°C
- F. Boiling point/range: -104°C

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G. Flash point: - 136°C (c.c)

H. Evaporation rate: Not applicable

I. Flammability (solid, gas): Flammable gas

J. Flammability Limit (lower/upper): 2.7% ~ 36%

K. Vapor pressure: 8100mmHg (20°C)

L. Solubility in water: 131 mg/L (25°C)

M. Vapor density(Air=1): 0.98

N. Specific gravity: Not applicable

O. Partition Coefficient(n-Octanol/water): 1.13

P. Auto-ignition temperature: 490°C

Q. Thermal decomposition: Not available

R. Viscosity: 0.01cP (20°C)

S. Molecular weight: 28.05

10. Stability and Reactivity

A. Stability and possibility of hazardous reaction:

- May polymerize at temperatures over 600°C.
- Avoid using or storing above room temperature.
- Polymerization releases heat.
- Contains gas under pressure; may explode if heated.
- May violently polymerize and result in fire and explosion.

B. Conditions to avoid:

- Keep away from heat, open flame, sparks, other ignition sources.
- Minimize the contact of foreign materials.
- May contact other flammable materials and result in fire.

C. Incompatible material:


- Peroxides, metal, metal salt, acid, oxidizer, halogen
- Flammable and oxidizing materials

D. Hazardous decomposition products:

- Thermal decomposition or combustion products: Carbon oxides
- Fire will produce irritating, corrosive and/or toxic gases.

11. Toxicological Information

A. Route of exposure

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1) Inhalation: Not applicable

2) Ingestion: Not available

3) Skin/Eye contact: Not available

B. Delayed and immediate effects and also chronic effects from short and long term exposure

1) Acute toxicity: Not classified

- Oral: Not available
- Dermal: Not available
- Inhalation: Not classified
 - Rat(male), LC₅₀ (5hr) > 10,000ppm, No death

2) Skin corrosion/irritation: Not available

3) Serious eye damage/irritation: Not available

4) Respiratory sensitization: Not available

5) Skin sensitization: Not available

6) Carcinogenicity: Not classified

- IARC: GROUP 3 (Not classifiable as to its carcinogenicity to humans)
- ACGIH: A4 (Not Classifiable as a Human Carcinogen)

7) Germ cell mutagenicity: Not classified

- In vitro: Bacterial reverse mutation assay: with/ without metabolic activation: Negative (OECD TG 471)
- In vitro: Mammalian chromosome aberration test: With/without metabolic activation: Negative (OECD TG 473, GLP)
- In vivo: Mammalian Erythrocyte Micronucleus Test: Negative (OECD TG 474, GLP)

8) Reproductive toxicity: Not classified

- There was no evidence of toxicity or adverse effects in male and female rats on reproductive performance and offspring by reproduction / developmental toxicity screening test. (NOAEC(P)=5,000ppm, NOAEC(F1)=5,000ppm) (OECD TG 421, GLP)

9) STOT-single exposure: Not classified


- The acute toxicity of ethylene is low, but very high concentrations may cause asphyxia due to oxygen displacement.

10) STOT-repeated exposure: Not classified

- Treatment-related histopathological observations were limited to the upper respiratory tract. The morphologic diagnosis was a bilateral, eosinophilic rhinitis with mucous cell hyperplasia/hypertrophy (MCH) and occasional epithelial hyalinosis. (NOAEC(systemic toxicity)=10,000ppm(=11,473mg/m³), LOEC=300ppm(=344.2mg/m³) (OECD TG 413, GLP)

11) Aspiration hazard : Not available

12. Ecological Information

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A.Ecotoxicity:

1) Acute toxicity: Category 3

2) Chronic toxicity: Not classified

- Fishes: Not available
- Crustacea(*Daphnia magna*): NOECs(16d)=37.4mg/L
- Seaweeds(*Pseudokirchnerella subcapitata*): ErC₅₀(72h)=72.2mg/L (OECD TG 201, GLP)
(*Pseudokirchnerella subcapitata*): NOEC(72h)=13.9mg/L (biomass)
(OECD TG 201, GLP)

B. Persistence and Degradability:

1) Persistence: Low persistency (log Kow is less than 4 estimated.) (Log Kow=1.13)

2) Degradability: The results of the BioHCwin predictions for ethylene indicate that it will degrade rapidly, with an estimated half life of 2.905 days. (QSAR) (estimated)

C. Bioaccumulation potential:

1) Biodegradation: Not available

2) Bioaccumulation: Bioaccumulation is expected to be low according to the BCF < 500
(BCF=2.586)(estimated)

D. Mobility in soil: No potency of mobility to soil. (Koc=9.557) (estimated)

E.Hazardous to the ozone layer: Not classified

F. Other adverse effects: Not available

13. Disposal Consideration

A. Disposal method:

- Waste must be disposed of in accordance with federal, state and local environmental control regulations.

B. Disposal instruction:

- Consider the required attentions in accordance with waste treatment management regulation.


14. Transportation Information

A. UN classification: 1962

B. Proper shipping name: ETHYLENE

C. Class/division: 2.1

D. Packing group: Not applicable

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E. Marine pollutant: Not applicable

F. Special precautions for user related to transport or transportation measures

- ☐ Local transport follows in accordance with Dangerous goods Safety Management Law.
- ☐ Package and transport follow in accordance with Department of Transportation (DOT) and other regulatory agency requirements.
 - EmS FIRE SCHEDULE: F-D
 - EmS SPILLAGE SCHEDULE: S-U

15. Regulatory Information

A. Additional national and/or international regulatory information

- ☐ Information of EU 1272/2008(CLP) Classification:
 - Classification: Flam. Gas 1, Press. Gas, STOT SE 3
 - Risk Phrases: H220, H336
 - Safety Phrase: P210, P271, P261, P304+P340, P312, P377, P381, P403+P233, P405, P410+P403, P501
- ☐ U.S. Federal regulations:
 - OSHA PROCESS SAFETY (29CFR1910.119): Not regulated
 - CERCLA Section 103 (40CFR302.4): Not regulated
 - EPCRA Section 302 (40CFR355.30): Not regulated
 - EPCRA Section 304 (40CFR355.40): Not regulated
 - EPCRA Section 313 (40CFR372.65): Regulated
- ☐ Rotterdam Convention listed ingredients: Not regulated
- ☐ Stockholm Convention listed ingredients: Not regulated
- ☐ Montreal Protocol listed ingredients: Not regulated

16. Other Information

A. Key literature reference and sources for data:

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>

NIOSH (The National Institute for Occupational Safety and Health)

ACGIH (American Conference of Governmental Industrial Hygienists)

ECHA; <http://echa.europa.eu/registration-dossier/-/registered-dossier/15859>


OECD SIDS; <http://webnet.oecd.org/Hpv/UI/SIDS>

TOMES-LOLI®; <http://www.rightanswerknowledge.com/loginRA.asp>

☐ National Emergency Management Agency-Korea dangerous material inventory management system; <http://www.nema.go.kr/hazmat/main/main.jsp>

Waste Control Act enforcement regulation attached [1]

National chemicals information systems; <http://ncis.nier.go.kr>

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B. Key to abbreviations and acronyms

ACGIH - American Conference of Governmental Industrial Hygienists
ECHA - The European Chemicals Agency
OECD - The Organisation for Economic Co-operation and Development
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
IARC - International Agency for Research on Cancer
NIOSH - National Institute for Occupational Safety and Health
OSHA - Occupational Safety and Health Administration
NTP - National Toxicology Program
TSCA - Toxic Substances Control Act
NFPA - National Fire Protection Association
LC₅₀ - The concentration of a material expected to kill 50% of an animal test group.
LD₅₀ - The dose of a material expected to kill 50% of an animal test group.
EC₅₀ - median effective concentration
STEL - Short Term Exposure Limit
TWA - Time weight Average
TLV - Threshold Limit Value (recommended by ACGIH)

C. Preparation date: Jul. 29, 2016

D. Revision number and date:

- ☐ Version: 4nd
- ☐ Revision data: 04. 01, 2022
 - rev.4 : Change company name and logo

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