NOSB NATIONAL LIST
FILE CHECKLIST

PROCESSING

MATERIAL NAME: **# 10 Ethylene**

✓ **NOSB Database Form**

✓ **References**

✓ **MSDS (or equivalent)**

____ **FASP (FDA)**

✓ **TAP Reviews from:** **Joe Montecalvo, Rich Theuer, Chris Milne**

NOSB/NATIONAL LIST
COMMENT FORM
PROCESSING

Material Name: #10 Ethylene

Please use this page to write down comments, questions, and your anticipated vote(s).

COMMENTS/QUESTIONS:

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1. In my opinion, this material is:
_____ Synthetic _____ Non-synthetic.

2. Should this material be allowed in an "organic food" (95% or higher organic ingredients)? _____ Yes _____ No
(IF NO, PROCEED TO QUESTION 3.)

3. Should this substance be allowed in a "food made with organic ingredients" (50% or higher organic ingredients)? _____ Yes _____ No

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: August 29, 1995

Name of Material: Ethylene Gas

Reviewer Name: Dr. Joe Montecalvo

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

Synthetic

If synthetic, how is the material made? (please answer here if our database form is blank) Manufactured by decomposition of petroleum gases or by dehydration of Ethanol.

This material should be added to the National List as:

✓ **Synthetic Allowed** ____ **Prohibited Natural**

or, ____ **Non-synthetic (This material does not belong on National List)**

Are there any use restrictions or limitations that should be placed on this material on the National List?

Crops, Processing (i.e. Storage Atmosphere)

Please comment on the accuracy of the information in the file: good.

Any additional comments? (attachments welcomed)

— Major use in Food industry is to accelerate the ripening of certain fruits

Do you have a commercial interest in this material? ____ **Yes;** ✓ **No**

Signature [signature] **Date** 7/31/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

None

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

High concentrations CAUSE NARCOSIS

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

none

(4) the effect of the substance on human health;

See # 2.

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

little

(6) the alternatives to using the substance in terms of practices or other available materials; and

None.

(7) its compatibility with a system of sustainable agriculture.

Only for specified Applications

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: August 29, 1995

Name of Material: Ethylene Gas

Reviewer Name: R THELER

Is this substance Synthetic or non-synthetic? Explain (if appropriate) SYNTHETIC

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

✓ Synthetic Allowed ____ Prohibited Natural

or, ____ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

RIPENING CERTAIN FRUITS (PARTICULARLY BANANAS)

Please comment on the accuracy of the information in the file:

GOOD

Any additional comments? (attachments welcomed)

Do you have a commercial interest in this material? ____ Yes; ✓ No

Signature [signature] **Date** 8/28/95

Please address the 7 criteria in the Organic Foods Production Act:
(comment in those areas you feel are applicable)

(1) the potential of such substances for detrimental chemical interactions with other materials used in organic farming systems;

N/A

(2) the toxicity and mode of action of the substance and of its breakdown products or any contaminants, and their persistence and areas of concentration in the environment;

ONLY TRACES ARE USED TO "TRIGGER" RIPENING IN BANANAS

(3) the probability of environmental contamination during manufacture, use, misuse or disposal of such substance;

SEE DOCUMENTATION ATTACHED
FLAMMABLE GAS SO EXPLOSION HAZARD

(4) the effect of the substance on human health;

ACUTE RESPIRATORY ~~PROBLEMS~~ EXPOSURE / DEATH POSSIBLE

MINIMAL CONCERN WITH EFFECTIVE CONCENTRATIONS USED OR PRODUCED BY RIPENING FRUIT

(5) the effects of the substance on biological and chemical interactions in the agroecosystem, including the physiological effects of the substance on soil organisms (including the salt index and solubility of the soil), crops and livestock;

NONE
~~SMALL~~ AT PROPER USAGE LEVELS

(6) the alternatives to using the substance in terms of practices or other available materials; and

NONE FOR BANANAS, PINEAPPLE

(7) its compatibility with a system of sustainable agriculture.

POSITIVE - ALLOWS MARKETING OF ORGANIC TROPICAL FRUITS

TAP REVIEWER COMMENT FORM for USDA/NOSB

Use this page or an equivalent to write down comments and summarize your evaluation regarding the data presented in the file of this potential National List material. Complete both sides of page. Attach additional sheets if you wish.

This file is due back to us by: August 29, 1995

Name of Material: Ethylene Gas

Reviewer Name: CHRIS MILNE

Is this substance Synthetic or non-synthetic? Explain (if appropriate)

SYNTHETIC

If synthetic, how is the material made? (please answer here if our database form is blank)

This material should be added to the National List as:

X Synthetic Allowed ____ Prohibited Natural

or, ____ Non-synthetic (This material does not belong on National List)

Are there any use restrictions or limitations that should be placed on this material on the National List?

Phase out over 5 years (See attachment, OFPA CRITERIA [7])

Please comment on the accuracy of the information in the file:

OK

Any additional comments? (attachments welcomed)

See attachment

Do you have a commercial interest in this material? ____ Yes; X No

Signature [signature] **Date** 8/28/95

CHRIS MILNE

ETHYLENE GAS

OFPA CRITERIA
(1) The proposed use is not consistent with a potential for detrimental chemical interaction except as related to fire and explosion hazards. However, they are incompatible with chlorine products and oxidizing agents in general.
(5) The proposed use is not consistent with the potential for any significant biological interaction with the agroecological system.
(7) This chemical seems incompatible with the principles of sustainable agriculture. The reason for permitting its use is related solely to economics since alternatives do exist and would appear to be available to the discrete segment of the agricultural community which is served by this chemical. Moreover, it is a synthetic chemical and a dangerous chemical for its users. While it is not as toxic overall as some synthetics which will remain on the list, it is not as indispensable to a sustainable system of agriculture. Its retention on the list, therefore, is due more to its limited use and the unwillingness to unduly burden a small segment of agricultural producers. While this is laudable, I'm not sure it is sufficient reason to outweigh the fact that the chemical is not natural, is toxic and is not indispensable to the continued economic viability of an overall system of sustainable agriculture. Therefore, it must be considered incompatible with a system of sustainable agriculture. It should be phased out over five years.

REFERENCES
Manahan, Stanley E., TOXICOLOGICAL CHEMISTRY: A GUIDE TO TOXIC SUBSTANCES IN CHEMISTRY, 1989, Lewis Publishers, Inc.

Klaassen, Curtis D. et al, editors, CASARETT AND DOULL'S TOXICOLOGY, 3rd Edition, 1986, Macmillan Publishing Co.

NOSB Materials Database

Identification

Common Name **Ethylene Gas** **Chemical Name** Ethene

Other Names

Code #: CAS 74-85-1 **Code #: Other** DOT #: UN 1962/UN 1938

N. L. Category Synthetic Allowed **MSDS** yes

Chemistry

Family Olefin

Composition CH_2

Properties A colorless, flammable gas with a slightly sweet odor, soluble in water.

How Made Made from hydrocarbon feedstocks, such as natural gas liquids or crude oil. Produced almost exclusively from the pyrolysis of hydrocarbons in tubular reactor coils installed in externally fired heaters. These heaters are operated at high temperatures (750-900°C), short residence times (0.1-0.6s), and low hydrocarbon partial pressure. Steam is added.

Ethylene may also be produced by dehydration of ethanol in fixed or fluid-bed reaction systems. This means it could be made from biomass fermentation, but that is not currently done in the U.S.

Use/Action

Type of Use Crops & Processing

Use(s) Ripening fruit, including bananas, pears and tomatoes and citrus. Induces flowering in pineapples.

Action Acts like the natural analog plant growth regulator by accelerating the ripening process through an exact mechanism that is not fully understood.

Combinations

Status

OFPA

N. L. Restriction Allowed for use on bananas only.

EPA, FDA, etc Registration

Directions

Safety Guidelines Highly flammable and explosive. Handle with extreme caution.

State Differences

Historical status allowed for use on bananas by many certifiers and states.

Internationl status

OFPA Criteria

!119(m)1:chem. inter.

2119(m)2: toxicity Acute toxicity may include death of animals, birds, or fish and death or low growth rate in plants. Slight acure toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term or long-term effects of ethylene to birds or land animals. Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and others. Non-persistent in water, with a half-life of less than 2 days. About 99.9% will eventually end up in air; the rest in water.

2119(m)3:manufacture Ethylene or olefin plants require extensive support facilities to comply with environmental regulations. These include boiler feed water preparation, treatment of noxious effluents, and steam and electric generation. See "Petroleum Distillates" for more details.

2119(m)4:humans Highly flammable and explosive. Exposure to gas causes dizziness and could cause suffocation from decreasing the amount of oxygen.

2119(m)5: biology

2119(m)6:alternatives natural ripening: temperature control, mix with apples for natural ethylene generation. No alternative for pineapples to extend season.

2119(m)7:compatible

References

See attached.

ETHYLENE REFERENCES

AU: Wills,-R.B.H.
TI: Postharvest technology of banana and papaya in ASEAN: an overview.
SO: A-S-E-A-N-Food-J. Kuala Lumpur : Asean Food Handling Bureau. Apr 1990. v. 5 (2) p. 47-50.
CN: DNAL TX341.A74

AU: Ke,-L.S.; Tsai,-P.L.
TI: Changes of ACC content and EFE activity in peel and pulp of banana fruit during ripening in relation to ethylene production.
SO: J-Agric-Assoc-China. Taipei, Taiwan : The Association. Sept 1988. (143) p. 48-60.
CN: DNAL 22.5-AG862

AU: Inaba,-A.; Nakamura,-R.
TI: Numerical expression for estimating the minimum ethylene exposure time necessary to induce ripening in banana fruit.
SO: J-Am-Soc-Hortic-Sci. Alexandria, Va. : The Society. July 1988. v. 113 (4) p. 561-564.
CN: DNAL 81-SO12

AU: Beaudry,-R.M.; Paz,-N.; Black,-C.C.; Kays,-S.J.
TI: Banana ripening: implications of changes in internal ethylene and CO2 concentrations, pulp fructose 2,6-bisphosphate concentration, and activity of some glycolytic enzymes.
SO: Plant-Physiol. Rockville, Md. : American Society of Plant Physiologists. Sept 1987. v. 85 (1) p. 277-282.
CN: DNAL 450-P692

AU: Mertens,-E.; Marcellin,-P.; Schaftingen,-E.-van; Hers,-H.G.
TI: Effect of ethylene treatment on the concentration of fructose-2,6-bisphosphate and on the activity of phosphofructokinase 2/fructose-2,6-bisphosphatase in banana.
SO: Eur-J-Biochem. Berlin, W. Ger. : Springer International. Sept 1987. v. 167 (3) p. 579-583.
CN: DNAL QP501.E8

AU: Banks,-N.H.
TI: Responses of banana fruit to pro-long coating at different times relative to the initiation of ripening.
SO: Sci-Hortic. Amsterdam : Elsevier Science Publishers. June 1985. v. 26 (2) p. 149-157.
CN: DNAL SB13.S3

AU: Bangerth,-F.
TI: Changes in sensitivity for ethylene during storage of apple and banana fruits under hypobaric conditions.
SO: Sci-Hortic. Amsterdam : Elsevier Science Publishers. Nov 1984. v. 24 (2) p. 151-163. ill.
CN: DNAL SB13.S3

AU: Dominguez,-M.; Vendrell,-M.
TI: Ethylene biosynthesis in banana fruit: evolution of EFE activity and ACC levels in peel and pulp during ripening.
SO: J-Hortic-Sci. Ashford : Headley Brothers Ltd. Jan 1993. v. 68 (1) p. 63-70.
CN: DNAL 80-J825

AU: Chang,-W.H.; Hwang,-Y.J.
TI: Effect of ethylene treatment on the ripening, polyphenoloxidase activity and water-soluble tannin content of Taiwan northern banana at different maturity stages and the stability of banana polyphenoloxidase.
SO: Acta-Hortic. Wageningen : International Society for Horticultural Science. July 1990 (275) p. 603-610.
CN: DNAL 80-AC82
AB: Bananas of maturity stages of 0.6, 0.7 and 0.8 were treated at 20 degrees C with ethylene concentrations ranging from 0 to 100 ppm, and the effect of these treatments on respiration rate and ethylene formation was determined. Bananas harvested at maturity stage 0.8 ripened normally without application of exogenous

ethylene, but those harvested at 0.6 and 0.7 maturity stages required exogenous ethylene for normal ripening, suggesting that the optimum stage of maturity is 0.8. During ripening tannin was translocated from the peel to the fruit pulp where it was metabolised by the PPO. PPO activity was optimal at pH 8 to 8.5, and the PPO was fairly heat resistant.

AU: Blackbourn,-H.D.; Jeger,-M.J.; John,-P.
TI: Inhibition of degreening in the peel of bananas ripened at tropical temperatures. V. Chlorophyll bleaching activity measured in vitro.
SO: Ann-Appl-Biol. Warwick : Association of Applied Biologists. Aug 1990. v. 117 (1) p. 175-186.
CN: DNAL 442.8-AN72

AU: Kubo,-Y.; Inaba,-A.; Nakamura,-R.
TI: Respiration and C2H4 production in various harvested crops held in CO2-enriched atmospheres.
SO: J-Am-Soc-Hortic-Sci. Alexandria, Va. : The Society. Nov 1990. v. 115 (6) p. 975-978.
CN: DNAL 81-SO12
AB: The respiration rate (O2 uptake) and the rate of C2H4 production were measured before, during, and after 24 hours of treatment with 60% CO2 (20% O2) in 18 kinds of fruits and vegetables by use of an automated system connected to a microcomputer. High CO2 decreased respiration only in climacteric fruit and broccoli, which were producing C2H4. Ethylene production decreased with CO2 treatment of peaches, tomatoes, and broccoli, but that of bananas increased. In five nonclimacteric fruits (three citrus species, grapes, and Japanese pears) and several vegetables (carrots, onions, cauliflower, and cabbage), in which C2H4 production was not detected, high CO2 affected respiration little, if at all. When eggplants, cucumbers, podded peas, spinach, and lettuce were treated with high CO2, C2H4 production began and respiration increased. These results indicate that the respiratory responses of harvested horticultural crops to high CO2 might be mediated by the effects of CO2 on the action and/or synthesis of C2H4.

AU: Scriven,-F.M.; Gek,-C.O.; Wills,-R.B.H.
TI: Sensory differences between bananas ripened without and with ethylene.
SO: HortScience. Alexandria, Va. : Amer. Society for Horticultural Science. Dec 1989. v. 24 (6) p. 983-984.
CN: DNAL SB1.H6

AU: Kanellis,-A.K.; Solomos,-T.; Mattoo,-A.K.
TI: Changes in sugars, enzymic activities and acid phosphatase isoenzyme profiles of bananas ripened in air or stored in 2.5% O2 with and without ethylene.
SO: Plant-Physiol. Rockville, Md. : American Society of Plant Physiologists. May 1989. v. 90 (1) p. 251-258.
CN: DNAL 450-P692
AB: This study investigates the effect of 2.5% O2, both alone and in combination with ethylene, on respiration, sugar accumulation and activities of pectin methylesterase and acid phosphatase during ripening of bananas (Musa paradisiaca sapientum). In addition, the changes in the phosphatase isoenzyme profiles are also analyzed. Low oxygen diminished respiration and slowed down the accumulation of sugars and development of the yellow color. Furthermore, low O2 prevented the rise in acid phosphatase activities and this suppression was not reversed by the inclusion of 100 microliters per liter ethylene in 2.5% O2 atmosphere.

AU: Bangerth,-F.
TI: Changes in sensitivity for ethylene during storage of apple and banana fruits under hypobaric conditions.
SO: Sci-Hortic. Amsterdam : Elsevier Science Publishers. Nov 1984. v. 24 (2) p. 151-163. ill.
CN: DNAL SB13.S3

AU: Henze,-J.; Pekmezci,-M.; Baumann,-H.
TI: Effects of ethrel and ethylene on the ripening of bananas.
SO: Acta-Hortic. The Hague : International Society for Horticultural Science. Aug 1983. (138) p. 173-177. ill.
CN: DNAL 80-AC82

AU: Esguerra,-E.B.; Mendoza,-D.B.-Jr.; Pantastico,-E.B.

TI: Regulation of fruit ripening. II. Use of Perlite-KMnO4 insert as an ethylene absorbent On mangoes, and bananas, storage life.
SO: Phillip-J-Sci. Manila, National Science Development Board. Mar/June 1978 (pub. 1980) v. 107 (1/2) p. 23-31.
CN: DNAL 475-P53

AU: Liu,-F-W
TI: Ethylene inhibition of senescent spots on ripe bananas
SO: J-Am-Soc-Hortic-Sci, Nov 1976, 101 (6): 684-686.
CN: DNAL 81-SO12

AU: Terai,-H; Ueda,-Y; Ogata,-K
TI: Studies on the mechanism of ethylene action for fruits ripening. i. [Bananas]
SO: J-Jap-Soc-Hortic-Sci, Mar 1973, 42 (1): 75-80. Eng. sum.
CN: DNAL 87-H78

AU: Peacock,-B-C
TI: Role of ethylene in the initiation of fruit ripening. [Bananas]
SO: Queensland-J-Agr-Anim-Sci, June 1972, 29 (2): 137-145. Ref.
CN: DNAL 23-Q37

AU: Hesselman,-C-W; Freebairn,-H-T
TI: Rate of ripening of initiated bananas as influenced by oxygen and ethylene
SO: J-Amer-Soc-Hort-Sci, Nov 1969, 94 (6): 635-637.
CN: DNAL 81-SO12

AU: Quazi,-M-H; Freebairn,-H-T
TI: The influence of ethylene, oxygen, and carbon dioxide on the ripening of bananas
SO: Bot-Gaz, Mar 1970, 131 (1): 5-14.
CN: DNAL 450-B652

AU: Lallu,-N.; Searle,-A.N.; MacRae,-E.A.
TI: An investigation of ripening and handling strategies for early season kiwifruit (Actinidia deliciosa cv Hayward).
SO: J-Sci-Food-Agric. Essex : Elsevier Science Publishers. 1989. v. 47 (4) p. 387-400.
CN: DNAL 382-SO12
AB: Several strategies for ripening and handling early season kiwifruit (Actinidia deliciosa (A Chev) Liang et Ferguson cv Hayward) were investigated. Fruit were harvested from the same block of mature vines of kiwifruit in 1985 and 1986, when fruit had reached 5.5 and 6.2% w/v soluble solids concentration (SSC), and treated with ethylene (1 ml litre-1, 12 h, 20 degrees C), either before or after cool storage at 0 degrees C for either 4 or 6 weeks. Softening was more rapid and uniform in response to ethylene treatment, irrespective of fruit maturity or prior treatment. Delays at ambient temperature and/or 20 degrees C prior to ethylene treatment had no effect on subsequent softening rates. Fruit harvested at 5.5% SSC always had acceptable eating quality if treated with ethylene. The results indicate that several ripening and handling strategies are possible for early season kiwifruit.

AU: Kader,-A.A.
TI: Biochemical and physiological basis for effects of controlled and modified atmospheres on fruits and vegetables.
SO: Food-Technol. Chicago, Ill. : Institute of Food Technologists. May 1986. v. 40 (5) p. 99-100, 102-104.
CN: DNAL 389.8-F7398
AB: Abstract: A literature review discusses the possible direct and indirect effects of controlled atmospheres (CA's) on the biochemical and physiological properties of fruits and vegetables during transport and storage. The effects specifically discussed are those associated with: respiratory metabolism; ethylene biosynthesis and action; chemical changes affecting product color, texture, flavor, and nutritional value; growth and development; physical injuries caused by bruising; water loss; and physiological

disorders alleviated, aggravated, or induced by CA's. The role of CA's on controlling pathogens that promote postharvest decay also is discussed.(wz).

AU: Watada,-A.E.
TI: Effects of ethylene on the quality of fruits and vegetables.
SO: Food-Technol. Chicago, Ill. : Institute of Food Technologists. May 1986. v. 40 (5) p. 82-85.
CN: DNAL 389.8-F7398
AB: Abstract: A review article discusses the advantages and disadvantages of using ethylene or an ethylene precursor (ethephon) to induce ripening of fruits and vegetables. Ethylene treatment initiates or accelerates the loss of green color in plant tissue, decreases firmness, adversely affects textural quality, increases ascorbic acid levels (tomatoes), has a differential effect on the chemical composition of certain fruits and vegetables, accelerates quality degradation during food storage/holding, and decreases chilling injury during prolonged chilled storage. The mechanism by which ethylene triggers or regulates these attributes is not known.(wz).

AU: Proctor,-F.J.; Caygill,-J.C.
TI: Ethylene in commercial post-harvest handling of tropical fruit.
SO: Proc-Easter-Sch-Agric-Sci-Univ-Nottingham. London : Butterworths. 1985. (39th) p. 317-332.
CN: DNAL S217.E2

AU: Hartmann,-C.
TI: Ethylene and ripening of a non-climacteric fruit: the cherry.
SO: Acta-Hortic. Wageningen : International Society for Horticultural Science. Dec 1989. (258) p. 89-96.
CN: DNAL 80-AC82

AU: Knee,-M.
TI: Control of post-harvest action of ethylene on tree fruits.
SO: Acta-Hortic. Wageningen : International Society for Horticultural Science. July 1989. (239) p. 417-426.
CN: DNAL 80-AC82

AU: Redgwell,-R.J.; Melton,-L.D.; Brasch,-D.J.
TI: Cell wall changes in kiwifruit following post harvest ethylene treatment.
SO: Phytochemistry. Oxford : Pergamon Press. 1990. v. 29 (2) p. 399-407.
CN: DNAL 450-P5622

AU: Lougheed,-E.C.; Murr,-D.P.; Toivonen,-P.M.A.
TI: Ethylene and nonethylene volatiles.
SO: Postharvest physiology of vegetables / edited by J. Weichmann. N. Y. : M. Dekker, c1987. p. 255-276.
CN: DNAL SB324.6.P67

AU: Goodenough,-P.W.
TI: A review of the role of ethylene in biochemical control of ripening in tomato fruit.
SO: Plant-Grow-Regul. Dordrecht, Netherlands : Martinus Nijhoff/W. Junk. 1986. v. 4 (2) p. 125-137. ill.
CN: DNAL QK745.P56

AU: Brady,-C.; McGlasson,-B.; Speirs,-J.
TI: The biochemistry of fruit ripening.
SO: Plant-Biol. New York : Alan R. Liss. 1987. v. 4 p. 279-288. ill.
CN: DNAL QH301.P535

AU: Hobson,-G.E.; Harman,-J.E.; Nichols,-R.
TI: Ethylene and the control of tomato fruit ripening.
SO: Adv-Agric-Biotechnol. The Hague : Martinus Nijhoff/W. Junk Publishers. 1984. (9) p. 281-289. ill.
CN: DNAL S494.5.B563A39

FACT SHEET ON ETHYLENE

Common Name: Ethylene
DOT Number: UN 1962/UN 1038

CAS Number: 74-85-1
Date: January, 1989

HAZARD SUMMARY

* Ethylene gas can affect you when breathed in.
* Ethylene gas is HIGHLY FLAMMABLE and EXPLOSIVE. This is the major hazard of Ethylene exposure.
* Exposure to the gas can cause you to feel dizzy, lightheaded, and to pass out.
* Contact with liquid Ethylene could cause frostbite.
* Ethylene may cause suffocation. Excessive amounts in the air in an enclosed space will decrease the amount of oxygen.
* The health effects caused by exposure to Ethylene are much less serious than its FIRE and EXPLOSION RISK.

IDENTIFICATION

Ethylene is a colorless gas at room temperatures. At very low temperatures it is a liquid. It is used as a refrigerant and in welding and cutting metals.

REASON FOR CITATION

* Ethylene is on the Hazardous Substance List because it is cited by ACGIH, DOT, NFPA and EPA.
* This chemical is on the Special Health Hazard Substance List because it is FLAMMABLE and REACTIVE.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting air samples. Under OSHA 1910.20, you have a legal right to obtain copies of sampling results from you employer. If you think you are experiencing any work related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.
* ODOR THRESHOLD = 290 ppm.
* The odor threshold only serves as a warning of exposure. Not smelling it does not mean you are not being exposed.

WORKPLACE EXPOSURE LIMITS

* No exposure limits have been determined.
* Large amounts of Ethylene will decrease the amount of available oxygen. Before entering an enclosed space, oxygen content should be tested to ensure that it is at least 19.5% by volume.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear specially designed protective clothing where exposure to cold equipment, vapors, or liquid can occur.
* Permanently installed analyzers should be used to monitor for a dangerous release of Ethylene gas.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Ethylene to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects
The following acute (short term) health effects may occur immediately or shortly after exposure to Ethylene:

* Exposure can cause you to feel dizzy, lightheaded, and to pass out.
* Contact with liquid Ethylene can cause frostbite.

Chronic Health Effects
The following chronic (long term) health effects can occur at some time after exposure to Ethylene and can last for months or years:

Cancer Hazard
* There is insufficient evidence available to evaluate Ethylene for its ability to cause cancer in animals.

Reproductive Hazard
* According to the information presently available to the New Jersey Department of Health, Ethylene has not been tested for its ability to adversely affect reproduction.

Other Long Term Effects
* Ethylene has not been tested for other chronic (long term) health effects.

MEDICAL

Medical Testing
* There is no special test for this chemical. However, if illness occurs or overexposure is suspected, medical attention is recommended.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.20.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, ENGINEERING CONTROLS are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following controls are recommended:
* Where possible, automatically pump liquid Ethylene from storage containers to process containers.
* Before entering a confined space which may contain Ethylene, check to make sure that sufficient oxygen (at least 19.5%) exists.
* Before entering a confined space where Ethylene may be present, check to make sure that an explosive concentration does not exist.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT.
However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.
Clothing
* Where exposure to cold equipment, vapors, and liquid may occur, special gloves and clothing designed to prevent freezing of body tissues should be used.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection
* Wear splash proof chemical goggles and face shield when working with liquid, or gas proof mask when working with gas, unless full facepiece respiratory protection is worn.

Respiratory Protection
IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Engineering controls must be effective to ensure that exposure to Ethylene does not occur.
* Exposure to Ethylene gas is dangerous because it can replace oxygen and lead to suffocation. Only MSHA/NIOSH ap proved self contained breathing apparatus with a full facepiece operated in positive pressure mode should be used in oxygen deficient environments.

HANDLING AND STORAGE

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* Prior to working with Ethylene you should be trained on its proper handling and storage.
* Procedures for the handling, use and storage of Ethylene cylinders should be in compliance with OSHA 1910.101 and follow the recommendations of the Compressed Gas Association as well as OSHA 1910 Subpart M.
* Store in tightly closed containers in a cool well ventilated area away from CHLORINE COMPOUNDS, OXIDIZING AGENTS, and COMBUSTIBLE MATERIALS.
* Sources of ignition such as smoking and open flames are prohibited where Ethylene is handled, used, or stored.
* Use only non sparking tools and equipment, especially when opening and closing containers of Ethylene.
* Wherever Ethylene is used, handled, manufactured, or stored, use explosion proof electrical equipment and fittings.
* Piping should be electrically bonded and grounded.

Common Name: ETHYLENE
DOT Number: UN 1962/UN 1038
DOT Emergency Guide code: 22
CAS Number: 74-85-1

NFPA Hazard Rating

FLAMMABILITY	4
REACTIVITY	2

CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

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FIRE HAZARDS

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* Ethylene is a FLAMMABLE LIQUID OR GAS.
* Vapors may travel to a source of ignition and flash back.
* CONTAINERS MAY EXPLODE IN FIRE.
* Stop flow of gas. Use dry chemical, CO_2, or water spray in large amounts.
* Use water spray to keep fire exposed containers cool.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES
If Ethylene is leaked, take the following steps:

* Restrict persons not wearing protective equipment from area of leak until cleanup is complete. Contact may cause severe burns and vapor build up may cause suffocation.
* Remove all ignition sources.
* Ventilate area of leak to disperse the gas.
* Stop flow of gas. If source of leak is a cylinder and the leak cannot be stopped in place, remove the leaking cylinder to a safe place in the open air, and repair leak or allow cylinder to empty.
* Keep Ethylene out of a confined space, such as a sewer, because of the possibility of an explosion, unless the sewer is designed to prevent the buildup of explosive concentrations.
* It may be necessary to contain and dispose of Ethylene as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

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FOR LARGE SPILLS AND FIRES immediately call your fire department.
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FIRST AID

POISON INFORMATION

Eye Contact
* Seek medical attention.

Skin Contact
* Quickly immerse affected part in warm water.
* Seek medical attention.

Breathing
* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Flash Point: 213oF (136oC)
Water Solubility: Slightly soluble

OTHER COMMONLY USED NAMES
Chemical Name: Ethene

Other Names and Formulations: Acetene; Olefiant Gas; Bicarburretted Hydrogen.

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625 0368

ECOLOGICAL INFORMATION

Ethylene is a colorless, flammable gas with a slightly sweet odor, which is produced in very large volumes. It is a main building block of the petrochemical industry, and is converted to many intermediate and end products, including plastics, resins, fibers, elastomers, solvents, surfactants, coatings, plasticizers and antifreeze. It may enter the environment from industrial discharges or spills.

ACUTE (SHORT-TERM) ECOLOGICAL EFFECTS

Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen two to four days after animals or plants come in contact with a toxic chemical substance.

Ethylene has slight acute toxicity to aquatic life. Ethylene has caused injuries of many kinds to numerous agricultural crops. Insufficient data are available to evaluate or predict the short-term effects of ethylene to birds or land animals.

CHRONIC (LONG-TERM) ECOLOGICAL EFFECTS

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure(s) to a toxic chemical.

Ethylene has slight chronic toxicity to aquatic life. Insufficient data are available to evaluate or predict the long-term effects of ethylene to plants, birds, or land animals.

WATER SOLUBILITY

Ethylene is highly soluble in water. Concentrations of 1,000 milligrams and more will mix with a liter of water.

DISTRIBUTION AND PERSISTENCE IN THE ENVIRONMENT

Ethylene is non-persistent in water, with a half-life of less than 2 days. The half-life of a pollutant is the amount of time it takes for one-half of the chemical to be degraded. About 99.9% of ethylene will eventually end up in air; the rest will end up in the water.

BIOACCUMULATION IN AQUATIC ORGANISMS

Some substances increase in concentration, or bioaccumulate, in living organisms as they breathe contaminated air, drink contaminated water, or eat contaminated food. These chemicals can become concentrated in the tissues and internal organs of animals and humans.

SUPPORT DOCUMENT: AQUIRE Database, ERL-Duluth, U.S. EPA.