ETHYL ETHER

EET

CAUTIONARY RESPONSE INFORMATION

Common Synonyms
Anesthesia ether
Anesthetic ether
Diethyl ether
Diethyl oxide
Ether
Ethoxyethane

Watery liquid Colorless Sweet odor

Floats on water. Flammable, irritating vapor is produced. Boiling point is 94°F.

Evacuate.
Keep people away. Avoid contact with liquid and vapor.
Avoid inhalation.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to ``knock down'' vapor.
Notify local health and pollution control agencies.
Protect water intakes.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge

2. CHEMICAL DESIGNATIONS

2.1 CG Compatibility Group: 41; Ether
2.2 Formula: $C_2H_5OC_2H_5$
2.3 IMO/UN Designation: 3.1/1155
2.4 DOT ID No.: 1155
2.5 CAS Registry No.: 60-29-7
2.6 NAERG Guide No.: 127
2.7 Standard Industrial Trade Classification: 51616

3. HEALTH HAZARDS

3.1 Personal Protective Equipment: Approved organic vapor canister mask; chemical goggles; synthetic rubber or plastic gloves.
3.2 Symptoms Following Exposure: Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritating. Skin contact from clothing wet with the chemical may cause burns.
3.3 Treatment of Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is irregular, give oxygen; call a physician. EYES: flush immediately with water for 15 min.
3.4 TLV-TWA: 400 ppm
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: 500 ppm
3.7 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: None
3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
3.11 Liquid or Solid Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.
3.12 Odor Threshold: 0.83 ppm
3.13 IDLH Value: 1,900 ppm
3.14 OSHA PEL-TWA: 400 ppm
3.15 OSHA PEL-STEL: Not listed.
3.16 OSHA PEL-Ceiling: Not listed.
3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

4.1 Flash Point: -40°F O.C. : -49°F C.C.
4.2 Flammable Limits in Air: 1.85%-36.5%
4.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or foam
4.4 Fire Extinguishing Agents Not to Be Used: Not pertinent
4.5 Special Hazards of Combustion Products: Not pertinent
4.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Decomposes violently when heated.
4.7 Auto Ignition Temperature: 356°F
4.8 Electrical Hazards: Class I, group C
4.9 Burning Rate: 6.7 mm/min.
4.10 Adiabatic Flame Temperature: Currently not available
4.11 Stoichometric Air to Fuel Ratio: 28.6 (calc.)
4.12 Flame Temperature: Currently not available
4.13 Combustion Molar Ratio (Reactant to Product): 9.0 (calc.)
4.14 Minimum Oxygen Concentration for Combustion (MOCC): N_2 diluent: 10.3-10.5%; CO_2 diluent: 13.0%

5. CHEMICAL REACTIVITY

5.1 Reactivity with Water: No reaction
5.2 Reactivity with Common Materials: No reaction
5.3 Stability During Transport: Stable
5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
5.5 Polymerization: Not pertinent
5.6 Inhibitor of Polymerization: Not pertinent

6. WATER POLLUTION

6.1 Aquatic Toxicity: Currently not available
6.2 Waterfowl Toxicity: Currently not available
6.3 Biological Oxygen Demand (BOD): 3%, 5 days
6.4 Food Chain Concentration Potential: None
6.5 GESAMP Hazard Profile: Not listed

7. SHIPPING INFORMATION

7.1 Grades of Purity: Reagent; absolute; purified; anesthesia; USP; concentrated
7.2 Storage Temperature: Ambient
7.3 Inert Atmosphere: Inerted
7.4 Venting: Pressure-vacuum
7.5 IMO Pollution Category: Currently not available
7.6 Ship Type: 2
7.7 Barge Hull Type: 2

8. HAZARD CLASSIFICATIONS

8.1 49 CFR Category: Flammable liquid
8.2 49 CFR Class: 3
8.3 49 CFR Package Group: I
8.4 Marine Pollutant: No
8.5 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue).....	2
Flammability (Red).....	4
Instability (Yellow).....	1

8.6 EPA Reportable Quantity: 100 pounds
8.7 EPA Pollution Category: B
8.8 RCRA Waste Number: U117
8.9 EPA FWPCA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

9.1 Physical State at 15° C and 1 atm: Liquid
9.2 Molecular Weight: 74.12
9.3 Boiling Point at 1 atm: 94.3°F = 34.6°C = 307.8°K
9.4 Freezing Point: –177.3°F = –116.3°C = 156.9°K
9.5 Critical Temperature: 380.3°F = 193.5°C = 466.7°K
9.6 Critical Pressure: 527 psia = 35.9 atm = 3.64 MN/m^2
9.7 Specific Gravity: 0.714 at 20°C (liquid)
9.8 Liquid Surface Tension: 17.0 dynes/cm = 0.0170 N/m at 20°C
9.9 Liquid Water Interfacial Tension: Not pertinent
9.10 Vapor (Gas) Specific Gravity: 2.6
9.11 Ratio of Specific Heats of Vapor (Gas): 1.081
9.12 Latent Heat of Vaporization: 153 Btu/lb = 84.9 cal/g = 3.56 X 10^5 J/kg
9.13 Heat of Combustion: –14,550 Btu/lb = –8082 cal/g = –338.4 X 10^5 J/kg
9.14 Heat of Decomposition: Not pertinent
9.15 Heat of Solution: Not pertinent
9.16 Heat of Polymerization: Not pertinent
9.17 Heat of Fusion: 23.45 cal/g
9.18 Limiting Value: Currently not available
9.19 Reid Vapor Pressure: 16.0 psia

NOTES

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9.20 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
-110	51.170
-100	50.820
-90	50.460
-80	50.100
-70	49.740
-60	49.370
-50	49.010
-40	48.640
-30	48.270
-20	47.900
-10	47.530
0	47.150
10	46.780
20	46.400
30	46.020
40	45.640
50	45.250
60	44.870
70	44.480
80	44.090
90	43.700

9.21 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
35	0.523
40	0.528
45	0.533
50	0.538
55	0.543
60	0.548
65	0.553
70	0.558
75	0.563
80	0.568
85	0.573
90	0.578

9.22 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit inch per hour-square foot-F
-80	1.141
-70	1.125
-60	1.109
-50	1.093
-40	1.077
-30	1.061
-20	1.044
-10	1.028
0	1.012
10	0.996
20	0.980
30	0.964
40	0.948
50	0.931
60	0.915
70	0.899
80	0.883

9.23 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
-35	0.445
-30	0.428
-25	0.412
-20	0.397
-15	0.383
-10	0.370
-5	0.358
0	0.346
5	0.335
10	0.324
15	0.314
20	0.305
25	0.296
30	0.287
35	0.279
40	0.271
45	0.264
50	0.257
55	0.250
60	0.243
65	0.237
70	0.231
75	0.226
80	0.220
85	0.215
90	0.210

9.24 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
34	12.790
36	12.480
38	12.170
40	11.860
42	11.550
44	11.240
46	10.930
48	10.610
50	10.300
52	9.992
54	9.681
56	9.370
58	9.059
60	8.748
62	8.437
64	8.126
66	7.815
68	7.503
70	7.192
72	6.881
74	6.570
76	6.259
78	5.948
80	5.637
82	5.326
84	5.015

9.25 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
-70	0.112
-60	0.170
-50	0.252
-40	0.366
-30	0.524
-20	0.738
-10	1.023
0	1.398
10	1.885
20	2.510
30	3.304
40	4.302
50	5.543
60	7.072
70	8.942
80	11.210
90	13.930
100	17.190
110	21.040
120	25.590
130	30.910
140	37.100

9.26 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
-70	0.00199
-60	0.00293
-50	0.00424
-40	0.00603
-30	0.00842
-20	0.01159
-10	0.01570
0	0.02099
10	0.02771
20	0.03613
30	0.04659
40	0.05944
50	0.07509
60	0.09397
70	0.11660
80	0.14340
90	0.17500
100	0.21200
110	0.25510
120	0.30480
130	0.36190
140	0.42710

9.27 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	0.327
25	0.339
50	0.350
75	0.362
100	0.373
125	0.385
150	0.396
175	0.407
200	0.419
225	0.430
250	0.441
275	0.452
300	0.463
325	0.474
350	0.484
375	0.495
400	0.506
425	0.517
450	0.527
475	0.538
500	0.548
525	0.558
550	0.569
575	0.579
600	0.589