## Ethane, 2-chloro-1-(difluoromethoxy)-1,1,2-trifluoro- (cas 13838-16-9) MSDS

**MSDS** : Ether, 2-chloro-1,1,2-trifluoroethyl difluoromethyl

**CAS** : 13838-16-9

**SYNONYMS** :
- * Anesthetic Compound No. 347
- * 2-Chloro-1-(difluoromethoxy)-1,1,2-trifluoroethane
- * 2-Chloro-1,1,2-trifluoroethyl difluoromethyl ether
- * Compound 347
- * Enflurane
- * Ethane, 2-chloro-1-(difluoromethoxy)-1,1,2-trifluoro-
- * Ethrane
- * Methylfluorether
- * NSC-115944
- * OHIO 347

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### *** CHEMICAL IDENTIFICATION ***

<table>
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<th>RTECS NUMBER</th>
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<td>MOLECULAR WEIGHT</td>
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<td>WISWESSER LINE NOTATION</td>
<td>GYFXFFOYFF</td>
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**SYNONYMS/TRADE NAMES** :
- * Anesthetic Compound No. 347
- * 2-Chloro-1-(difluoromethoxy)-1,1,2-trifluoroethane
- * 2-Chloro-1,1,2-trifluoroethyl difluoromethyl ether
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- * Enflurane
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- * Ethrane
- * Methylfluorether
- * NSC-115944
- * OHIO 347

### *** HEALTH HAZARD DATA ***

#### ** SKIN/EYE IRITATION DATA **

**TYPE OF TEST** : Standard Draize test

**ROUTE OF EXPOSURE** : Administration into the eye

**SPECIES OBSERVED** : Rodent - rabbit

**DOSE/DURATION** : 100 mg

**REACTION SEVERITY** : Moderate


### ** ACUTE TOXICITY DATA **

**TYPE OF TEST** : TCLo - Lowest published toxic concentration

**ROUTE OF EXPOSURE** : Inhalation

**SPECIES OBSERVED** : Human

**DOSE/DURATION** : 1 pph/6H

**TOXIC EFFECTS** : Kidney, Ureter, Bladder - urine volume decreased

**REFERENCE** : ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 45,557,1976
TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Oral
SPECIES OBSERVED: Rodent - rat
DOSE/DURATION: 5450 uL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981

TYPE OF TEST: LC50 - Lethal concentration, 50 percent kill
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE/DURATION: 14000 ppm/3H
TOXIC EFFECTS:
Details of toxic effects not reported other than lethal dose value
REFERENCE:

TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Intraperitoneal
SPECIES OBSERVED: Rodent - rat
DOSE/DURATION: 6 mL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981

TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Subcutaneous
SPECIES OBSERVED: Rodent - rat
DOSE/DURATION: 19500 uL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981

TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Oral
SPECIES OBSERVED: Rodent - mouse
DOSE/DURATION: 5 mL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981

TYPE OF TEST: LC50 - Lethal concentration, 50 percent kill
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - mouse
DOSE/DURATION: 8100 ppm/3H
TOXIC EFFECTS:
Details of toxic effects not reported other than lethal dose value
REFERENCE:

TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Intraperitoneal
SPECIES OBSERVED: Rodent - mouse
DOSE/DURATION: 3900 uL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981

TYPE OF TEST: LD50 - Lethal dose, 50 percent kill
ROUTE OF EXPOSURE: Subcutaneous
SPECIES OBSERVED: Rodent - mouse
DOSE/DURATION: 38800 uL/kg
TOXIC EFFECTS:
Lungs, Thorax, or Respiration - acute pulmonary edema
Lungs, Thorax, or Respiration - other changes
REFERENCE:
YKYUA6 Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1-1950- Volume(issue)/page/year: 32,491,1981
** OTHER MULTIPLE DOSE TOXICITY DATA **

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE/DURATION: 170 ppm/3H/4W-I

TOXIC EFFECTS:
- Liver - other changes
- Liver - changes in liver weight

REFERENCE:
YKYUA Yakkyoku. Pharmacy. (Nanzando, 4-1-11, Yushima, Bunkyo-ku, Tokyo, Japan) V.1- 1950- Volume(issue)/page/year: 32,491,1981

** TUMORIGENIC DATA **

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - mouse
DOSE/DURATION: 3000 ppm/4H/78W-I

TOXIC EFFECTS:
- Tumorigenic - Carcinogenic by RTECS criteria
- Lungs, Thorax, or Respiration - tumors
- Liver - tumors

REFERENCE:
ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 56,9,1982

** REPRODUCTIVE DATA **

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE: 16500 ppm/6H
SEX/DURATION: female 8-10 day(s) after conception

TOXIC EFFECTS:
- Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus)

REFERENCE:
ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 64,339,1986

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE: 20 ppm/8H
SEX/DURATION: female 28 day(s) pre-mating
female 1-21 day(s) after conception

TOXIC EFFECTS:
- Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus)

REFERENCE:

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE: 1500 ppm/6H
SEX/DURATION: female 1-20 day(s) after conception

TOXIC EFFECTS:
- Reproductive - Effects on Newborn - other postnatal measures or effects

REFERENCE:
AIPTAK Archives Internationales de Pharmacodynamie et de Therapie. (Heymans Institute of Pharmacology, De Pintelaan 185, B-9000 Ghent, Belgium) V.4- 1898- Volume(issue)/page/year: 256,134,1982

TYPE OF TEST: TCLo - Lowest published toxic concentration
ROUTE OF EXPOSURE: Inhalation
SPECIES OBSERVED: Rodent - rat
DOSE: 16500 ppm/6H
SEX/DURATION: female 11-13 day(s) after conception

TOXIC EFFECTS:
- Reproductive - Specific Developmental Abnormalities - musculoskeletal system

REFERENCE:
ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 64,339,1986
SEX/DURATION: female 6-15 day(s) after conception  
TOXIC EFFECTS:
Reproductive - Effects on Embryo or Fetus - fetotoxicity (except death, e.g., stunted fetus)
Reproductive - Specific Developmental Abnormalities - musculoskeletal system
REFERENCE:

TYPE OF TEST: TCLo - Lowest published toxic concentration  
ROUTE OF EXPOSURE: Inhalation  
SPECIES OBSERVED: Rodent - mouse  
DOSE: 1000 ppm/4H  
SEX/DURATION: female 6-15 day(s) after conception

TOXIC EFFECTS:
Reproductive - Specific Developmental Abnormalities - Central Nervous System
Reproductive - Specific Developmental Abnormalities - Craniofacial (including nose and tongue)
Reproductive - Specific Developmental Abnormalities - Musculoskeletal System
REFERENCE:
ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 54, 505, 1981

** MUTATION DATA **

TYPE OF TEST: Cytogenetic analysis
TEST SYSTEM: Human Lymphocyte
DOSE/DURATION: 1000 ppm
REFERENCE:

TYPE OF TEST: Mutation test systems - not otherwise specified
ROUTE OF EXPOSURE: Inhalation
TEST SYSTEM: Rodent - rat
DOSE/DURATION: 1 ppm/3H (Continuous)
REFERENCE:
EXPEDAM Experientia. (Birkhaeuser Verlag, POB 133, CH-4010 Basel, Switzerland) V.1- 1945- Volume(issue)/page/year: 35, 71, 1979

TYPE OF TEST: Cytogenetic analysis
TEST SYSTEM: Rodent - mouse Fibroblast
DOSE/DURATION: 1000 ppm
REFERENCE:

TYPE OF TEST: Sperm Morphology
ROUTE OF EXPOSURE: Inhalation
TEST SYSTEM: Rodent - mouse
DOSE/DURATION: 12000 ppm/4H/5D (Intermittent)
REFERENCE:
ANESAV Anesthesiology. (Lippincott/Harper, Journal Fulfillment Dept., 2350 Virginia Ave., Hagerstown, MD 21740) V.1- 1940- Volume(issue)/page/year: 54, 53, 1981

TYPE OF TEST: Cytogenetic analysis
ROUTE OF EXPOSURE: Parenteral
TEST SYSTEM: Bird - chicken
DOSE/DURATION: 10 mg
REFERENCE:

*** REVIEWS ***

ACGIH TLV-Not classifiable as a human carcinogen
DTLV* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: TLV/BEI, 1997

ACGIH TLV-TWA 566 mg/m3 (75 ppm)
DTLVs* The Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) booklet issues by American Conference of Governmental Industrial Hygienists (ACGIH), Cincinnati, OH, 1996 Volume(issue)/page/year: TLV/BEI,1997

IARC Cancer Review:Animal Inadequate Evidence

*** OCCUPATIONAL EXPOSURE LIMITS ***

OEL-AUSTRALIA:TWA 0.5 ppm (3.8 mg/m3) JAN 1993
OEL-BELGIUM:TWA 75 ppm (566 mg/m3) JAN 1993
OEL-DENMARK:TWA 2 ppm (15 mg/m3) JAN 1993
OEL-SWEDEN:TWA 10 ppm (80 mg/m3); STEL 20 ppm (150 mg/m3) JAN 1993
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV

*** NIOSH STANDARDS DEVELOPMENT AND SURVEILLANCE DATA ***

NIOSH RECOMMENDED EXPOSURE LEVEL (REL) :
NIOSH REL TO ENFLURANE-air: CL 2 ppm/60M
REFERENCE :

NIOSH OCCUPATIONAL EXPOSURE SURVEY DATA :
NOES Hazard Code - X3127
No. of Facilities: 2871 (estimated)
No. of Industries: 2
No. of Occupations: 12
No. of Employees: 86214 (estimated)
No. of Female Employees: 73439 (estimated)

NOES Hazard Code - X9341
No. of Facilities: 21 (estimated)
No. of Industries: 1
No. of Occupations: 1
No. of Employees: 453 (estimated)
No. of Female Employees: 329 (estimated)

*** STATUS IN U.S. ***

EPA GENETOX PROGRAM 1988, Negative: V79 cell culture-gene mutation
EPA GENETOX PROGRAM 1988, Inconclusive: Histidine reversion-Ames test; Sperm morphology-mouse
OSHA ANALYTICAL METHOD #29

*** END OF RECORD ***