

Product: **FORANE® 449A (XP40)**

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SDS No.: 006714-001 (Version 1.0)

Date 24.05.2018

1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING**1.1. Identification of the product**

Identification of the mixture: FORANE® 449A (XP40)

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the Substance/Mixture : Refrigerant

1.3. Details of the supplier of the safety data sheet

| | |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supplier | ARKEMA Fluorochemicals 420 rue d'Estienne d'Orves 92705 Colombes Cedex, FRANCE Telephone: +33 (0)1 49 00 80 80 Telefax: +33 (0)1 49 00 83 96 E-mail address: pars-drp-fds@arkema.com http://www.arkema.com |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

1.4. Emergency telephone number

+ 33 1 49 00 77 77
European emergency phone number: 112
UK: National Chemical Emergency Centre Tel: 01865 407 333

2. HAZARDS IDENTIFICATION**2.1. Classification of the substance or mixture****Classification (REGULATION (EC) No 1272/2008):**

Gases under pressure, LG, H280

Additional information:

For the full text of the H, EUH-phrases mentioned in this Section, see Section 16.

2.2. Label elements**Label elements (REGULATION (EC) No 1272/2008):**Hazard
pictograms:

Signal word:

Warning

Hazard statements:

H280 : Contains gas under pressure; may explode if heated.

Precautionary statements:

Storage:

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

2.3. Other hazards

Liberates gas which may cause suffocation.

Potential health effects:

Inhalation: Slightly harmful by inhalation

Skin contact: Slightly irritating to skin.

Eye contact: Slightly irritating to eyes

Environmental Effects:

Slightly harmful to fish Slightly harmful to daphnia Slightly harmful to algae Not readily biodegradable.

Physical and chemical hazards:

VAPOR REDUCES OXYGEN AVAILABLE FOR BREATHING AND IS HEAVIER THAN AIR.
Decomposition products: See chapter 10

Other:

Results of PBT and vPvB assessment : According to REACH regulation, annex XIII, this mixture contains no substance meeting PBT and vPvB criteria.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2. Mixtures

Chemical nature of the mixture¹:

Hazardous components (accordance with Annex II of Regulation (EC) No 1907/2006 and its amendment(s)) :

| Chemical name ¹ & REACH Registration Number ² | EC-No. | CAS-No. | Concentration | Classification REGULATION (EC) No 1272/2008 |
|---------------------------------------------------------------------|-----------|----------|---------------|------------------------------------------------|
| 1,1,1,2-Tetrafluoroethane (01-2119459374-33) | 212-377-0 | 811-97-2 | 25,5 - 26,7 % | Press. Gas LG; H280 |
| 1-Propene, 2,3,3,3-tetrafluoro- (01-0000019665-61) | 468-710-7 | 754-12-1 | 24,3 - 25,5 % | Flam. Gas 1; H220 Press. Gas LG; H280 |
| Pentafluoroethane (01-2119485636-25) | 206-557-8 | 354-33-6 | 24,5 - 25,7 % | Press. Gas LG; H280 |
| Difluoromethane (01-2119471312-47) | 200-839-4 | 75-10-5 | 23,3 - 24,5 % | Flam. Gas 1; H220 Press. Gas LG; H280 |

¹: See chapter 14 for Proper Shipping Name

²: See the text of the regulation for applicable exceptions or provisions : The transition time according to REACH Regulation, Article 23, is still not expired.

4. FIRST AID MEASURES

4.1. Description of necessary first-aid measures:

General advice:

In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
When symptoms persist or in all cases of doubt seek medical advice.

Inhalation:

If inhaled Remove person to fresh air. If signs/symptoms continue, get medical attention.

Skin contact:

If on skin, flush exposed skin with lukewarm water (not hot), or use other means to warm skin slowly. Get medical attention immediately.

Eye contact:

Get medical attention immediately.

Ingestion:

Not applicable

Protection of first-aiders:

No special precautions are necessary for first aid responders.

4.2. Most important symptoms/effects, acute and delayed:

Symptoms: Dizziness confusion Lack of coordination Drowsiness Unconsciousness Skin contact may provoke the following symptoms:
Irritation Swelling of tissue Itching Discomfort Redness

4.3. Indication of immediate medical attention and special treatment needed, if necessary

Treatment: Treat symptomatically.

5. FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media:

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Special hazards arising from the substance or mixture: None.

5.3. Advice for firefighters:

Special protective actions for fire-fighters:

Wear self-contained breathing apparatus for firefighting if necessary. Use personal protective equipment.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures:

Evacuate personnel to safe areas. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits. Pump off large amounts. See Section 13, Disposal considerations, for additional information.

6.2. Environmental precautions:

Prevent further leakage or spillage if safe to do so. Retain and dispose of contaminated wash water.

6.3. Methods and materials for containment and cleaning up: None.

Elimination: See chapter 13

6.4. Reference to other sections: None.

7. HANDLING AND STORAGE

7.1. Precautions for safe handling:

Safe handling advice:

Avoid breathing gas. Handle in accordance with good industrial hygiene and safety practices. Wear cold-insulating gloves/face shield/eye protection. Use a backflow preventative device in piping. Close valve after each use and when empty. Do NOT change or force fit connections. Use only with adequate ventilation/personal protection. Keep away from heat and sources of ignition. Do not smoke. Take maximum precautions when handling. Take care to avoid waste and spillage when weighing, loading and mixing the product.

Hygiene measures:

Wash hands after handling. Remove contaminated clothing and protective equipment before entering eating areas.

7.2. Conditions for safe storage, including any incompatibilities:

Keep cylinders restrained. Separate full and empty cylinders. Do not store near combustible materials. Keep in properly labelled containers. Keep in a cool, well-ventilated place. Keep away from direct sunlight. Store in accordance with the particular national regulations.

Storage period: > 10 y, Storage temperature: < 52 °C

Incompatible products:

Do not store together with oxidizing and self-igniting products. Organic peroxides Self-heating substances and mixtures Substances and mixtures, which in contact with water, emit flammable gases Pyrophoric liquids Pyrophoric solids Flammable liquids Explosives

7.3. **Specific end use(s):** None.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters:

Exposure Limit Values

1,1,1,2-Tetrafluoroethane

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|----------|---------|------------|-------------|---------------|---------|
| WEEL | 2010 | TWA | 1.000 | 4.240 | - |
| EH40 WEL | 12 2011 | TWA | 1.000 | 4.240 | - |

1-Propene, 2,3,3,3-tetrafluoro-

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|--------|------|------------|-------------|---------------|---------|
|--------|------|------------|-------------|---------------|---------|

Pentafluoroethane

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|--------|------|------------|-------------|---------------|---------|
| WEEL | 2010 | TWA | 1.000 | 4.900 | - |

Difluoromethane

| Source | Date | Value type | Value (ppm) | Value (mg/m3) | Remarks |
|--------|------|------------|-------------|---------------|---------------------------------------------------------------------|
| ARKEMA | | TWA | 1.000 | 2.130 | Value recommended by the "Exposure Limit Value Committee" of ARKEMA |

Derived No Effect Level (DNEL): 1,1,1,2-TETRAFLUOROETHANE :

| End Use | Inhalation | Ingestion | Skin contact |
|-----------|----------------------|-----------|--------------|
| Workers | 13936 mg/m3 (LT, SE) | | |
| Consumers | 2476 mg/m3 (LT, SE) | | |

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): 1-PROPENE, 2,3,3,3-TETRAFLUORO- :

| End Use | Inhalation | Ingestion | Skin contact |
|-----------|-----------------------|-----------|--------------|
| Workers | 950 mg/m3 (SE, LT) | | |
| Consumers | 186400 mg/m3 (SE, LT) | | |

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): PENTAFLUOROETHANE :

| End Use | Inhalation | Ingestion | Skin contact |
|-----------|----------------------|-----------|--------------|
| Workers | 16444 mg/m3 (LT, SE) | | |
| Consumers | 1753 mg/m3 (LT, SE) | | |

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Derived No Effect Level (DNEL): DIFLUOROMETHANE :

| End Use | Inhalation | Ingestion | Skin contact |
|-----------|---------------------|-----------|--------------|
| Workers | 7035 mg/m3 (LT, SE) | | |
| Consumers | 750 mg/m3 (LT, SE) | | |

LE : Local effects, SE : Systemic effects, LT : Long term, ST : Short term

Predicted No Effect Concentration: 1,1,1,2-TETRAFLUOROETHANE :

| Compartment: | Value: |
|-----------------------------------------|---------------|
| Fresh water | 0,1 mg/l |
| Marine water | 0,01 mg/l |
| Water (Intermittent release) | 1 mg/l |
| Effects on waste water treatment plants | 73 mg/l |
| Fresh water sediment | 0,75 mg/kg dw |

Predicted No Effect Concentration: 1-PROPENE, 2,3,3,3-TETRAFLUORO- :

| Compartment: | Value: |
|------------------------------|----------|
| Water | 0,1 mg/l |
| Water (Intermittent release) | 1 mg/l |

Predicted No Effect Concentration: PENTAFLUOROETHANE :

| Compartment: | Value: |
|------------------------------|--------------|
| Fresh water | 0,1 mg/l |
| Water (Intermittent release) | 1 mg/l |
| Fresh water sediment | 0,6 mg/kg dw |

Predicted No Effect Concentration: DIFLUOROMETHANE :

| Compartment: | Value: |
|------------------------------|----------------|
| Fresh water | 0,142 mg/l |
| Water (Intermittent release) | 1,42 mg/l |
| Fresh water sediment | 0,534 mg/kg dw |

8.2. Exposure controls:

General protective measures:

Provide adequate ventilation., Wear suitable protective equipment., Ensure that eye flushing systems and safety showers are located close to the working place., When using do not eat, drink or smoke., Take off immediately all contaminated clothing.

Personal protective equipment:

Respiratory protection:

Recommended Filter type: Organic gas and low boiling vapour type
Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.

Hand protection:

Low temperature resistant gloves

Eye/face protection:

Chemical resistant goggles must be worn., Face-shield

Skin and body protection:

Skin should be washed after contact., Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Environmental exposure controls: See chapter 6

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance:

Physical state (20°C): gaseous
Form: Liquefied gas
Colour: clear
Odour: slight, ester-like
Odour threshold: No data available.
pH: No data available.
No data available

Boiling point/boiling range : -46 °C

Flash point: Not applicable

Evaporation rate: > 1

Flammability (solid, gas):

Flammability: Will not burn
Lower flammable limit : None. (ASTM E681-01)
Upper flammable limit : None. (ASTM E681-01)

Vapour pressure: 12.748 hPa , at 25 °C

Relative vapour density: 3,07 Reference substance: Air=1

Relative density (Water=1): 1,10 at 25 °C

Water solubility: No data available

| | |
|------------------------------------------------|------------------------------------------------------------------------------------|
| Partition coefficient: n-octanol/water: | Not applicable |
| Partition coefficient: n-octanol/water: | 1,1,1,2-TETRAFLUOROETHANE : log Kow : 1,06 , at 25 °C (OECD Test Guideline 107) |
| | 1-PROPENE, 2,3,3,3-TETRAFLUORO- : log Kow : 2 (OECD Test Guideline 117) |
| | PENTAFLUOROETHANE : log Kow : 1,48 , at 25 °C (OECD Test Guideline 107) |
| | DIFLUOROMETHANE : log Kow : 0,21 , at 25 °C (OECD Test Guideline 107) |
| Auto-ignition temperature: | No data available |
| Decomposition temperature: | No data available |
| Viscosity, kinematic: | Not applicable |
| Explosive properties: | |
| Explosivity: | Not explosive |
| Oxidizing properties: | The substance or mixture is not classified as oxidizing. |

9.2. Other data:

Critical point: Critical temperature: 81,5 °C

10. STABILITY AND REACTIVITY

10.1. Reactivity:

Not classified as a reactivity hazard.

10.2. Chemical stability: No data available.

10.3. Possibility of hazardous reactions:

Strong oxidizing agents

10.4. Conditions to avoid:

Heat, flames and sparks.

10.5. Incompatible materials to avoid: No data available.

10.6. Hazardous decomposition products:

Thermal decomposition:

No data available

Other decomposition products

Fluorocarbons, Gaseous hydrogen fluoride (HF)., Carbon oxides

11. TOXICOLOGICAL INFORMATION

All available and relevant data on this product and/or the components quoted in section 3 and/or the analogue substances/metabolites have been taken into account for the hazard assessment.

11.1. Information on toxicological effects:

Acute toxicity:

Inhalation:

According to its composition : Slightly harmful by inhalation

The inhalation of vapours produced by product decomposition can cause : , Risk of irritation of respiratory system, Toxic effects cannot be excluded

1,1,1,2-TETRAFLUOROETHANE :

As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause : , Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality

• In animals :

No mortality/4 h/Rat: 567000 ppm (Method: OECD Test Guideline 403)
Central nervous system depression, narcosis

DIFLUOROMETHANE :

At high vapour/fog concentrations : , headache, Dizziness, Drowsiness

As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause : , Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality

- In animals : No mortality/4 h/Rat: 520000 ppm (Method: OECD Test Guideline 403)
- PENTAFLUOROETHANE :
- Effects of breathing high concentrations of vapour may include:, headache, Dizziness, Drowsiness
As with other volatile aliphatic halogenated compounds, through vapour accumulation and/or inhalation of large quantities, the product can cause :, Loss of consciousness and cardiac disorders aggravated by stress and lack of oxygen, risk of mortality
- In animals : No mortality/4 h/Rat: 800000 ppm (Method: OECD Test Guideline 403)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
- In man : Effects of breathing high concentrations of vapour may include:
headache, Dizziness, Drowsiness
- In animals : No mortality/4 h/Rat: 398379 ppm (Method: OECD Test Guideline 403)
- HYDROGEN FLUORIDE :
- At high vapour/mist concentrations, Severely irritating to respiratory system, Risk of pulmonary oedema, Delayed effects possible
- In animals : LC50/10 min/Rat: 3,15 mg/l

Local effects (Corrosion / Irritation / Serious eye damage):

- Skin contact:** Slightly or not irritating to skin
Ejection of liquefied gas : frostbite possible
- Eye contact:** Slightly or not irritating to eyes

Respiratory or skin sensitisation:

- Inhalation:** According to its composition, can be considered as : Cardiac sensitization not observed
- 1,1,1,2-TETRAFLUOROETHANE :
- In animals : No-observed-effect level5 % (cardiac sensitization, Dog)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
- In animals : No-observed-effect level12 % (cardiac sensitization, Dog)
- PENTAFLUOROETHANE :
- In animals : No-observed-effect level10 % (cardiac sensitization, Dog)
- DIFLUOROMETHANE :
- In animals : No-observed-effect level35 % (cardiac sensitization, Dog)
- Skin contact:**
Not relevant (gas)

CMR effects :

- Mutagenicity:** According to its composition, this product should not be harmful in normal conditions of use

In vitro

- 1,1,1,2-TETRAFLUOROETHANE :
Ames test in vitro: Inactive (Method: OECD Test Guideline 471)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473)
In vitro gene mutations test on mammalian cells: Inactive
- DIFLUOROMETHANE :
Ames test in vitro: Inactive (Method: OECD Test Guideline 471)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473)
In vitro gene mutations test on mammalian cells: Inactive (Method: OECD Test Guideline 476)
- PENTAFLUOROETHANE :
Ames test: negative (Method: OECD Test Guideline 471)
In vitro test for chromosomal abnormalities on CHO cells: negative (Method: OECD Test Guideline 473)
In vitro chromosomal abnormality test on human lymphocytes: negative (Method: OECD Test Guideline 476)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
Ames test in vitro: (Method: OECD Test Guideline 471)
Active (76 %)
Inactive (12 %)
In vitro chromosomal abnormality test on human lymphocytes: Inactive (Method: OECD Test Guideline 473) (76 %)
In vitro gene mutations test on mammalian cells: Active (Method: OECD Test Guideline 476) (76 %)

In vivo

- 1,1,1,2-TETRAFLUOROETHANE :
Micronucleus test in vivo mouse: Inactive (Method: OECD Test Guideline 474)
DNA repair test on rats hepatocytes: Inactive
- DIFLUOROMETHANE :
Micronucleus test in vivo mouse: Inactive (Method: OECD Test Guideline 474)
- PENTAFLUOROETHANE :
Micronucleus test in vivo mouse: negative (Method: OECD Test Guideline 474)
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
micronucleus test: Inactive (Method: OECD Test Guideline 474)
comet assay: Inactive (Method: OECD Test Guideline 489)

Carcinogenicity: According to limited available data No evidence of carcinogenicity in animal studies.

- 1,1,1,2-TETRAFLUOROETHANE :
• In animals :
Absence of carcinogenic effects (Rat, 2 years, By inhalation)
No Observed Adverse Effect Level (NOAEL): 10.000 ppm

Absence of carcinogenic effects (Rat, 1 year, By oral route)
No Observed Adverse Effect Level (NOAEL): 300 mg/kg bw/day

Reproductive toxicity:

Fertility: Based on the available data, the substance is not suspected of having reprotoxic potential.

- 1,1,1,2-TETRAFLUOROETHANE :
• In animals :
Two-generation study
NOAEL (Parental toxicity) : 50.000 ppm
NOAEL (Fertility) : 50.000 ppm
NOAEL (Developmental Toxicity) : 50000 ppm
(rat, By inhalation)
- DIFLUOROMETHANE :
• In animals :
May be considered as comparable to a similar product for which experimental results are:
NOAEL (Parental toxicity) : > 50.000 ppm
NOAEL (Fertility) : > 50.000 ppm
NOAEL (Developmental Toxicity) : > 50000 ppm
(rat, mouse, Inhalation)
- PENTAFLUOROETHANE :
No data available.
- 1-PROPENE, 2,3,3,3-TETRAFLUORO- :
Two generations study.: Absence of toxic effects on fertility
NOAEL (Parental toxicity) : 50.000 ppm
NOAEL (Fertility) : 50.000 ppm
NOAEL (Developmental Toxicity) : 50000 ppm
(Method: OECD Test Guideline 416, Rat)

Foetal development: Based on the available data, the substance is not suspected of having developmental toxicity potential.

1,1,1,2-TETRAFLUOROETHANE :

- In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 40.000 ppm
NOAEL (Maternal Toxicity): 2.500 ppm
(Method: OECD Test Guideline 414, Rabbit, By inhalation)
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 50.000 ppm
NOAEL (Maternal Toxicity): 50.000 ppm
(Method: OECD Test Guideline 414, Rat, By inhalation)

DIFLUOROMETHANE :

- In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 50.000 ppm
NOAEL (Maternal Toxicity): 50.000 ppm
(Method: OECD Test Guideline 414, rat, rabbit, By inhalation)

PENTAFLUOROETHANE :

- In animals :
Absence of toxic effects for foetal development.
NOAEL (Developmental Toxicity): 245 mg/l
NOAEL (Maternal Toxicity): 245 mg/l
(Method: OECD Test Guideline 414, rat, rabbit, By inhalation)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

According to available experimental data:
(Method: OECD Test Guideline 414, By inhalation)
NOAEL (Developmental Toxicity): 4.000 ppm
NOAEL (Maternal Toxicity): 2.500 ppm
(Rabbit)
NOAEL (Developmental Toxicity): > 50.000 ppm
NOAEL (Maternal Toxicity): > 50.000 ppm
(Rat)

Specific target organ toxicity :

Single exposure :

The substance or mixture is not classified as specific target organ toxicant, single exposure.

Inhalation:

Non irritating to respiratory system

Repeated exposure:

The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

1,1,1,2-TETRAFLUOROETHANE :

- In animals :
Inhalation: No adverse effects reported.
NOAEL= 50000ppm (Rat, Several years)

DIFLUOROMETHANE :

- In animals :
Inhalation: No specific toxic effects
NOAEL= 50000ppm (Method: OECD Test Guideline 413, Rat, 3 Months)

PENTAFLUOROETHANE :

- In animals :
Studies of prolonged inhalation in animals have not shown sub-chronic toxic effects
Inhalation: NOAEL= 50000ppm (Method: OECD Test Guideline 413, Rat, 3 Months)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :

Inhalation: No adverse effects reported.
NOAEL= 50000ppm (Method: OECD Test Guideline 412, Rat, Subacute)
(Method: OECD Test Guideline 413, rat, 3 months)
inhalation: No specific toxic effects, NOAEL= 50000ppm
Target organs: Teeth, NOAEL= 15000ppm

Aspiration hazard:

Not relevant

12. ECOLOGICAL INFORMATION

Ecotoxicology Assessment: All available and relevant data on this product and/or the components quoted in section 3 and/or the analogue substances/metabolites have been taken into account for the hazard assessment.

From its composition, it must be considered as:

Acute aquatic toxicity : Harmful to aquatic life.

12.1. Acute toxicity :

Fish: From its composition, it must be considered as: Slightly harmful to fish

1,1,1,2-TETRAFLUOROETHANE : LC50, 96 h (Salmo gairdneri) : 450 mg/l (Method: OECD Test Guideline 203)

1-PROPENE, 2,3,3,3-TETRAFLUORO- : LC50, 96 h (Oryzias latipes) : 33 mg/l (Method: OECD Test Guideline 203)

PENTAFLUOROETHANE : May be considered as comparable to a similar product for which experimental results are:

PROPANE, 1,1,1,3,3-PENTAFLUORO- : LC50, 96 h (Danio rerio (zebra fish)) : > 200 mg/l (Method: OECD Test Guideline 203)

DIFLUOROMETHANE : LC50, 96 h (Freshwater fish) : 1.507 mg/l (Method: calculated)

Aquatic invertebrates: From its composition, it must be considered as: Slightly harmful to daphnia

1,1,1,2-TETRAFLUOROETHANE : EC50, 48 h (Daphnia magna (Water flea)) : 980 mg/l (Method: OECD Test Guideline 202)

1-PROPENE, 2,3,3,3-TETRAFLUORO- : EC50, 48 h (Daphnia magna (Water flea)) : 65 mg/l (Method: OECD Test Guideline 202)

PENTAFLUOROETHANE : May be considered as comparable to a similar product for which experimental results are:

1,1,1,3,3-PENTAFLUOROBUTANE : EC50, 48 h (Daphnia magna (Water flea)) : > 200 mg/l (Method: OECD Test Guideline 202)

DIFLUOROMETHANE : EC50, 48 h (Daphnia (water flea)) : 652 mg/l (Method: calculated)

Aquatic plants: From its composition, it must be considered as: Slightly harmful to algae

1,1,1,2-TETRAFLUOROETHANE : May be considered as comparable to a similar product for which experimental results are:

PENTAFLUOROETHANE : May be considered as comparable to a similar product for which experimental results are:

PROPANE, 1,1,1,3,3-PENTAFLUORO- : ErC50, 72 h (Pseudokirchneriella subcapitata) : > 118 mg/l (Method: OECD Test Guideline 201)

DIFLUOROMETHANE : EC r50, 96 h (algae) : 142 mg/l (Method: calculated)

1-PROPENE, 2,3,3,3-TETRAFLUORO- : EC r50 (Desmodesmus subspicatus (green algae)) : > 80 mg/l (Method: OECD Test Guideline 201, Growth inhibition)

Microorganisms:

1,1,1,2-TETRAFLUOROETHANE : EC10, 6 h (Pseudomonas putida) : > 730 mg/l

1-PROPENE, 2,3,3,3-TETRAFLUORO- : NOEC, 28 d (Activated sludge) : 8,87 mg/l (Method: OECD Test Guideline 301D)

Aquatic toxicity / Long term toxicity:

Fish:

1-PROPENE, 2,3,3,3-TETRAFLUORO- : NOEC (Cyprinus carpio) : 2,7 mg/l (Method: OECD Test Guideline 215)

Aquatic invertebrates:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :
NOEC, 21 d (Daphnia magna (Water flea)) : >= 20 mg/l (Method: OECD Test Guideline 211, reproduction)

Aquatic plants:

1-PROPENE, 2,3,3,3-TETRAFLUORO- :
NOEC r, 72 d (Desmodesmus subspicatus (green algae)) : >= 75 mg/l (Method: OECD Test Guideline 201)

12.2. Persistence and degradability :

Biodegradation (In water): All the products and/or main components quoted in section 3 and/or analogue substances/metabolites are not readily biodegradable.

1,1,1,2-TETRAFLUOROETHANE :
Not readily biodegradable.: 3 % after 28 d (Method: OECD Test Guideline 301D)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :
Not readily biodegradable.: 1 - 2 % after 28 d (Method: OECD Test Guideline 301 D)

PENTAFLUOROETHANE :
Not readily biodegradable.: 5 % after 28 d (Method: OECD Test Guideline 301 D)

DIFLUOROMETHANE :
Not readily biodegradable.: 5 % after 28 d (Method: OECD Test Guideline 301 D)

Photodegradation (In air):

1,1,1,2-TETRAFLUOROETHANE :
Degradation by radicals OH: Direct photolysis (Half-life) : 9,7 y

PENTAFLUOROETHANE :
Degradation by radicals OH: Direct photolysis (Half-life) : 29 y

DIFLUOROMETHANE :
Degradation by radicals OH: Direct photolysis (Half-life) : 3,39 y

12.3. Bioaccumulative potential :

Bioaccumulation: None of the product and /or main component quoted in section 3 and/or analogue substance/metabolite is expected to bioaccumulate.
Not applicable

1,1,1,2-TETRAFLUOROETHANE :
Partition coefficient: n-octanol/water: log Kow : 1,06 , at 25 °C (Method: OECD Test Guideline 107)

1-PROPENE, 2,3,3,3-TETRAFLUORO- :
Partition coefficient: n-octanol/water: log Kow : 2 (Method: OECD Test Guideline 117)

PENTAFLUOROETHANE :
Partition coefficient: n-octanol/water: log Kow : 1,48 , at 25 °C (Method: OECD Test Guideline 107)

DIFLUOROMETHANE :
Partition coefficient: n-octanol/water: log Kow : 0,21 , at 25 °C (Method: OECD Test Guideline 107)

12.4. Mobility in soil - Distribution among environmental compartments:

Vapor pressure: 12.748 hPa, 25 °C

12.5. Results of PBT and vPvB assessment :

According to REACH regulation, annex XIII, this mixture contains no substance meeting PBT and vPvB criteria.

12.6. Other adverse effects:

Global warming potential (GWP): 1,1,1,2-TETRAFLUOROETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 1.360

1-Propene, 2,3,3,3-tetrafluoro-
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 4

PENTAFLUOROETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 3.500

DIFLUOROMETHANE
Global warming potential with respect to CO2 (time horizon 100 years) , Value: 675

Ozone depletion potential: Ozone depletion potential; ODP; (R-11 = 1) , Value: 0

13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment:

Disposal of product: Dispose of in accordance with local regulations.

Disposal of packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

14. TRANSPORT INFORMATION

| Regulation | 14.1. UN number | 14.2. UN proper shipping name | 14.3. Classes* | Label | 14.4. PG* | 14.5. Environmental hazards | 14.6. Special precautions for user |
|----------------|-----------------|---------------------------------------------------------------------------------|----------------|-------|-----------|-----------------------------|------------------------------------|
| ADR | 1078 | REFRIGERANT GAS, N.O.S. (1,1,1,2-TETRAFLUOROETHANE, 2,3,3,3-TETRAFLUOROPROPENE) | 2 | 2.2 | | no | |
| ADN | 1078 | REFRIGERANT GAS, N.O.S. (1,1,1,2-TETRAFLUOROETHANE, 2,3,3,3-TETRAFLUOROPROPENE) | 2 | 2.2 | | no | |
| RID | 1078 | REFRIGERANT GAS, N.O.S. (1,1,1,2-TETRAFLUOROETHANE, 2,3,3,3-TETRAFLUOROPROPENE) | 2 | 2.2 | | no | |
| IATA Cargo | 1078 | Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene) | 2.2 | 2.2 | | no | |
| IATA Passenger | 1078 | Refrigerant gas, n.o.s. (1,1,1,2-Tetrafluoroethane, 2,3,3,3-Tetrafluoropropene) | 2.2 | 2.2 | | no | |
| IMDG | 1078 | REFRIGERANT GAS, N.O.S. (1,1,1,2-TETRAFLUOROETHANE, 2,3,3,3-TETRAFLUOROPROPENE) | 2.2 | 2.2 | | no | EmS Number: F-C, S-V |

*Description: 14.3. Transport hazard class(es)
14.4. Packing group

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable

15. REGULATORY INFORMATION

Safety data sheets: accordance with Annex II of Regulation (EC) No 1907/2006 and its amendment(s)

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture:

Additional regulations (European Union) :
Hazardous Waste Regulations 2005 Applies
UK REGULATION Chip3: Chemical (Hazard Information and Packaging for Supply) Regulations 2002

Major Accident Hazard Legislation Not applicable

15.2. Chemical safety assessment:

As the substance doesn't meet the criteria for classification and is neither PBT nor vPvB, according to REACH regulation, article 14(4), development of specific exposure scenarios is not required.

INVENTORIES:

| | |
|-------------|----------------|
| EINECS: | Conforms to |
| TSCA: | Consult ARKEMA |
| DSL: | Consult ARKEMA |
| IECSC (CN): | Consult ARKEMA |
| ENCS (JP): | Consult ARKEMA |
| ISHL (JP): | Consult ARKEMA |
| KECI (KR): | Consult ARKEMA |
| PICCS (PH): | Consult ARKEMA |
| AICS: | Consult ARKEMA |
| NZIOC: | Consult ARKEMA |

16. OTHER INFORMATION

Full text of H, EUH-phrases referred to under sections 2 and 3

| | |
|------|-----------------------------------------------------|
| H220 | Extremely flammable gas. |
| H280 | Contains gas under pressure; may explode if heated. |

Thesaurus:

NOAEL : No Observed Adverse Effect Level (NOAEL)
LOAEL : Lowest Observed Adverse Effect Level (LOAEL)
bw : Body weight
food : oral feed
dw : Dry weight
vPvB : very Persistent and very Bioaccumulative
PBT : Persistent, Bioaccumulative and Toxic

This information applies to the PRODUCT AS SUCH and conforming to specifications of ARKEMA. In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear. The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes. The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive. It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product. It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

NB: In this document the numerical separator of the thousands is the "." (point), the decimal separator is "," (comma).

