GPS Safety Summary

Substance Name:

Vinylidene fluoride

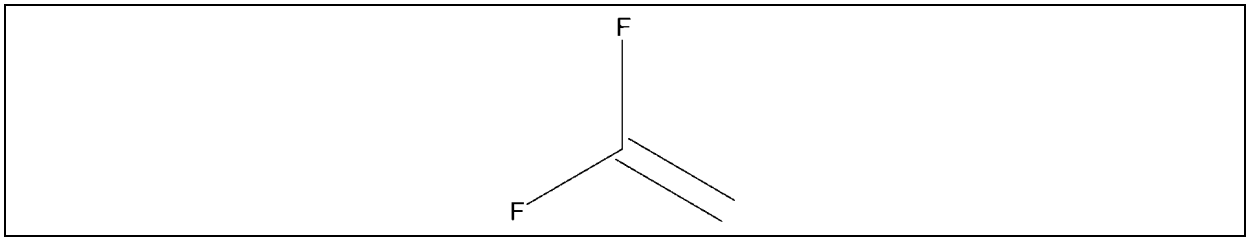
1. General Statement

Vinylidene fluoride is a fluorinated gas used as a monomer to produce polyvinylidene difluoride.

2. Chemical Identity

Names:	Vinylidene fluoride; VF2; VDF
Brand name:	none
Chemical names (IUPAC):	1,1-difluoroethene; 1,1-difluoroethylene
CAS number:	75-38-7
EC number:	200-867-7
Molecular formula:	$C_2H_2F_2$

Structure:



3. Use and applications

The main application of VF2 is to be used alone or with other fluorinated gases as a monomer to manufacture homo- and co-polymers with improved thermal stability, chemical resistance to acids and other aggressive products.

4. Physical / Chemical properties

VF2 is an extremely flammable liquefied gas with the following physicochemical properties:

Property	Value
Physical state	Gas at 20°C and 1013 hPa
Form	Liquefied gas (under pressure)
Colour	Colourless
Odour	Slightly ether-like
Molecular weight	64.0 g/mol
Density	670 kg/m^3 at 20°C (for liquid)
Vapour pressure	3.59 MPa at 20°C

Freezing / boiling points	-144°C / -83°C at 1013 hPa
Flash point	Not applicable
Flammability	Lower/Upper flammability limits: 5.8/20.3 % (v/v) Extremely flammable gas
Self-ignition temperature	640°C
Explosive / oxidizing properties	Not expected based on structure
Water solubility	254 mg/L at 28°C
Octanol-water partition coefficient (Log K_{ow})	1.24 at 20°C

5. Health Effects

VF2 is a gas at room temperature. Therefore, the main route of human exposure is via inhalation. Rapid absorption can be observed (maximum level in blood at 15 minutes) and some metabolism takes place in the liver however it does not lead to structural nor functional adverse effects.

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	Slightly harmful by inhalation. High concentrations may cause loss of consciousness. Dermal and oral: not relevant for a gas.
Irritation / corrosion Skin / eye / respiratory tract	No signs of respiratory tract irritation observed in the animals exposed by inhalation on an acute or repeated basis. Skin and eye: frostbite may occur upon contact with the liquefied form.
Sensitisation	Inhalation: no data. Dermal: not relevant for a gas.
Toxicity after repeated exposure Oral / inhalation / dermal	Studies of prolonged inhalation in animals showed no specific chronic toxic effects. Dermal and oral: not relevant for a gas.
Genotoxicity / Mutagenicity	Not expected to cause genetic effects based on available *in vitro* and *in vivo* test data.
Carcinogenicity	No carcinogenic effects were noted in rats and mice exposed for their lifetime.
Reproductive / Developmental Toxicity	No effects on *in utero* development and health of mother and fetus were seen in animals.

6. Environmental Effects

Testing of aquatic toxicity of gases is very difficult. VF2 was estimated, based on its structure, to be non-toxic to fish, aquatic invertebrates and algae.

As it is a gas, any emitted VF2 will quickly partition to the atmosphere, where it takes weeks to months to photolyse. It will not partition significantly to soil or sediment due to its low estimated adsorption coefficient (log K_{oc} = 1.08). It is not expected to bioaccumulate in the food chain based on its low lipophilicity (log K_{ow} = 1.24). As VF2 is a Hydrofluorocarbon gas, it's considered as a possible greenhouse gas. It is not ozone-depleting.

Effect Assessment	Result
Aquatic Toxicity	Acute: not toxic Chronic: no data

Fate and behaviour	Result
Degradation/Persistence	Poorly degradable. Does not persist in water/soil/sediment.
Bioaccumulation potential	Not expected to bioaccumulate significantly
PBT / vPvB conclusion	Not considered to be PBT* or vPvB**

*: Persistent, Bioaccumulative and Toxic (PBT)
**: very Persistent and very Bioaccumulative (vPvB)

7. Exposure

7.1 Human health

In accordance with the REACH Regulation, no exposure scenario is required in the absence of classification for human health.

Consumers:

Consumers are not directly exposed to VF2 since its industrial uses involve polymerisation into other substances.

In view of its use in closed systems, chemical transformation and low bioaccumulation potential, indirect exposure to VF2 via the environment is negligible.

Workers:

VF2 is industrially manufactured and polymerised in closed systems in a continuous or batch process, minimizing the occupational exposure potential. The use consists in polymerisation, *i.e.* chemical transformation. Workers may be exposed during cleaning, maintenance, transfer, sampling and analysis.

There is no professional exposure to VF2.

Procedures, controls, collective and personal risk management measures are in place, which limit the occupational exposure during the manufacture and use of the substance. Workers who might accidentally come into contact with the substance should follow the safety measures recommended in the Safety Data Sheet.

Risks are controlled when activities are carried out under conditions recommended in the Safety Data Sheet (see Chap. 8).

7.2 Environment

In accordance with the REACH Regulation, no exposure scenario is required in the absence of classification for the environment.

Industrial manufacture and polymerisation takes place in closed systems in a continuous or batch process, minimizing release to the atmosphere.

Though a possible greenhouse gas, VF2 is not cited by European regulations on fluorinated greenhouse gases. However, due to its use, emissions to the atmosphere are very low.

8. Risk Management recommendations

In accordance with the REACH Regulation, no risk assessment is required in the absence of classification for human health and the environment.

Human health measures		
Organizational	Collect the latest available Safety Data Sheet. Implement good basic standards of occupational hygiene. Ensure operatives are well informed of the hazards. Handle and store according to the indications of the Safety Data Sheet.	
Engineering controls	Keep away from open flames/hot surfaces/sources of sparks or ignition. No smoking. Store protected from sunlight, in a well-ventilated place. Provide appropriate local exhaust ventilation at points of emission. Ensure that fire extinguishing media, eye- and handwash stations and safety showers are close to workstation locations.	
Protection	**Eye/Face protection:**	Safety glasses with side-shields
	Skin protection:	Protective clothing
	Hand protection:	PVA gloves
	Respiratory protection:	Respirator if ventilation is insufficient
Environment protective measures		
Do not release into the environment.		

9. Regulatory Information / Classification and Labelling

9.1 Regulatory Information

This substance has notably been registered and/or assessed under:

- EU Regulation EC 1907/2006 (REACH)
- OECD SIDS (Screening Information Data Set) program

9.2 Classification and labelling

Under GHS, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the SDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers and emergency responders) can better understand the hazards of the chemicals in use. Substances registered for REACH are classified according to CLP (EC) 1272/2008, implementation of the GHS in the European Union.

Classification
– Flammable gases: Category 1. – Gases under pressure: Category Liquefied Gas.
Signal word
Danger

Pictograms	
— GHS02: Flame	
— GHS04: Gas cylinder	
Hazard statements	
— H220: Extremely flammable gas. — H280: Contains gas under pressure; may explode if heated.	

10. Contact Information within Company

For further information on this substance or product safety summary in general, please contact:

— **ICCA portal where the GPS Safety Summary is posted**:
http://www.icca-chem.org/en/Home/ICCA-initiatives/global-product-strategy/

11. Date of Issues / Revision

— Date of issue: 2013/01/30

— Date of revision:

12. Disclaimer

The information contained in this paper is intended as advice only and whilst the information is provided in utmost good faith and has been based on the best information currently available, is to be relied upon at the user's own risk.

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