

Solstice® 454C

000000026327

Version 1.1

Revision Date 06.11.2025

SECTION 1: Identification of the substance/mixture and of the company/undertaking**1.1. Product identifier**

Product name : Solstice® 454C
SDS-number : 000000026327
Type of product : Mixture
Remarks : SDS according to Art. 31 of Regulation (EC) 1907/2006.

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

Use of the Substance/Mixture : Refrigerant
Uses advised against : Direct evaporation applications

1.3. Details of the supplier of the safety data sheet

Company : SOLSTICE ADVANCED MATERIALS IRELAND LIMITED
1st Floor, Liffey Trust Centre,
117-126 Sheriff Street Upper
D01 YC43 Dublin
Ireland
Solstice Advanced Materials
US, Inc.
115 Tabor Road
Morris Plains, NJ 07950-2546
USA
Telephone : +353 1 447 9350
For further information,
please contact: : SafetyDataSheet@solstice.com

1.4. Emergency telephone number

Emergency telephone number : +1-703-527-3887 (ChemTrec-Transport)
+1 303-739-1378 (Medical)
: Poison Control Center:
United Kingdom: (+44) 844 892 0111

SECTION 2: Hazards identification**2.1. Classification of the substance or mixture****REGULATION (EC) No 1272/2008**

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Flammable gases Category 1B
 H221 Flammable gas.
 Gases under pressure Liquefied gas
 H280 Contains gas under pressure; may explode if heated.

2.2. Label elements
REGULATION (EC) No 1272/2008

Hazard pictograms	:		
Signal word	:	Danger	
Hazard statements	:	H221 H280	Flammable gas. Contains gas under pressure; may explode if heated.
Precautionary statements	:	P210 P377 P381 P410 + P403	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher. The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients
3.1. Substances

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Not applicable

3.2. Mixtures

Chemical name	CAS-No. Index-No. EC-No.	Classification 1272/2008	Concentration	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	754-12-1 468-710-7	Press. Gas Liquefied gas; H280 Flam. Gas 1B; H221	78,5 %	
Difluoromethane	75-10-5 200-839-4	Flam. Gas 1B; H221 Press. Gas ; H280	21,5 %	

Remaining components of this product are non-hazardous and/or are present at concentrations below reportable limits.

Occupational Exposure Limit(s), if available, are listed in Section 8.
For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures**4.1 Description of first aid measures***General advice:*

First aider needs to protect himself. Move out of dangerous area. Take off all contaminated clothing immediately.

Inhalation:

When inhaled remove to fresh air and seek medical aid. If breathing is irregular or stopped, administer artificial respiration. If unconscious, place in recovery position and seek medical advice.

Skin contact:

Rapid evaporation of the liquid may cause frostbite. In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully. Wash with plenty of water Wash contaminated clothing before re-use. Consult a physician.

Eye contact:

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Protect unharmed eye. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

Ingestion:

Ingestion is unlikely because of the physical properties and is not expected to be hazardous.

4.2. Most important symptoms and effects, both acute and delayed

No data available

4.3. Indication of any immediate medical attention and special treatment needed

Adrenaline derivatives are contra-indicated. Treat symptomatically.

See Section 11 for more detailed information on health effects and symptoms. :

SECTION 5: Firefighting measures**5.1. Extinguishing media***Suitable extinguishing media:*

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2. Special hazards arising from the substance or mixture

Flammable gas.

Contents under pressure.

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Vapors may travel to areas away from work site before igniting/flashing back to vapor source.

Fire or intense heat may cause violent rupture of packages.

Cool closed containers exposed to fire with water spray.

Do not allow run-off from fire fighting to enter drains or water courses.

In case of fire hazardous decomposition products may be produced such as:

Hydrogen fluoride

Carbonyl halides

Carbon monoxide

Carbon dioxide (CO₂)

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5.3. Advice for firefighters

Wear full protective clothing and self-contained breathing apparatus.
Evacuate personnel to safe areas. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

Immediately evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Wear personal protective equipment. Unprotected persons must be kept away. Wear self-contained breathing apparatus and protective suit. Eliminate all ignition sources if safe to do so. Avoid skin contact with leaking liquid (danger of frostbite). Ventilate the area. Vapors may travel to areas away from work site before igniting/flashing back to vapor source. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Ensure that the oxygen content is $\geq 19.5\%$.

6.2. Environmental precautions

The product evaporates readily. Prevent product from entering drains.

6.3. Methods and materials for containment and cleaning up

Use explosion-proof equipment.
No sparking tools should be used.
Ventilate the area.
Allow to evaporate.
Inform the responsible authorities in case of gas leakage, or of entry into waterways, soil or drains.
Pay attention to the spreading of gases especially at ground level (heavier than air) and to the direction of the wind.

6.4. Reference to other sections

For personal protection see section 8.

SECTION 7: Handling and storage**7.1. Precautions for safe handling**

Advice on safe handling:

Exhaust ventilation at the object is necessary. Pressurized container: protect from sunlight and do not expose to temperatures exceeding 50 °C. Do not pierce or burn, even after use. Use suitably rated equipment.

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Advice on protection against fire and explosion:

Keep product and empty container away from heat and sources of ignition. Fire or intense heat may cause violent rupture of packages. Use suitably rated equipment.

Hygiene measures:

Provide adequate ventilation. Do not smoke. When using do not eat or drink.

7.2. Conditions for safe storage, including any incompatibilities*Further information on storage conditions:*

Keep containers tightly closed in a cool, well-ventilated place. Containers should be protected against falling down. Protect from warmth. Keep away from direct sunlight. Keep only in the original container at temperature not exceeding 50°C

7.3. Specific end use(s)

no additional data available

SECTION 8: Exposure controls/personal protection**8.1. Control parameters***Occupational exposure limits:*

Components	Basis / Value type	Value / Form of exposure	Exceeding Factor	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	WEEL TWA	500 ppm		
2,3,3,3-Tetrafluoroprop-1-ene	HONEYWELL TWA	500 ppm		
Difluoromethane	HONEYWELL TWA	2.200 mg/m ³ 1.000 ppm		We are not aware of any national exposure limit.

WEEL - US Workplace Environmental Exposure Level

TWA - Time weighted average

DNEL/ PNEC-Values

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Component	End-use/impact	Exposure duration	Value	Exposure routes	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	Workers / Long-term systemic effects		950 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Long-term systemic effects		113,1 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Workers / Acute systemic effects		186400 mg/m3	Inhalation	
2,3,3,3-Tetrafluoroprop-1-ene	Consumers / Acute systemic effects		186400 mg/m3	Inhalation	
Difluoromethane	Workers / Long-term systemic effects		7035 mg/m3	Inhalation	
Difluoromethane	Consumers / Long-term systemic effects		750 mg/m3	Inhalation	

Component	Environmental compartment / Value	Remarks
2,3,3,3-Tetrafluoroprop-1-ene	Fresh water: 0,1 mg/l	
2,3,3,3-Tetrafluoroprop-1-ene	Marine water: 0,01 mg/l	
2,3,3,3-Tetrafluoroprop-1-ene	Fresh water sediment: 1,51 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Marine sediment: 0,151 mg/kg	
2,3,3,3-Tetrafluoroprop-1-ene	Soil: 1,49 mg/kg	
Difluoromethane	Fresh water: 0,142 mg/l	Assessment factor: 1000
Difluoromethane	Fresh water sediment: 0,534 mg/kg dw	

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8.2. Exposure controls**Occupational exposure controls**

The Personal Protective Equipment must be in accordance with EN standards:respirator EN 136, 140, 149; safety glasses EN 166; protective suit: EN 340, 463, 468, 943-1, 943-2; gloves EN 374, 511; safety shoes EN-ISO 20345.

Engineering measures

Highly effective exhaust ventilation

Personal protective equipment*Respiratory protection:*

In case of insufficient ventilation wear suitable respiratory equipment.

Self-contained breathing apparatus (EN 133)

Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.

Hand protection:

Protective gloves against cold
(EN 511)

Eye protection:

Safety goggles

Skin and body protection:

Wear suitable protective equipment.

Environmental exposure controls

Handle in accordance with local environmental regulations and good industrial practices.

SECTION 9: Physical and chemical properties**9.1. Information on basic physical and chemical properties**

- | | | |
|--------------------|---|----------------------|
| (a) Physical state | : | gaseous |
| (b) Colour | : | colourless |
| (c) Odour | : | slight
ether-like |

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- (d) Melting point/freezing point : No data available
- (e) Boiling point/boiling range : No data available
- (g) Lower and upper explosion limit : Lower explosion limit
7,7 %(V)
: Upper explosion limit
15,7 %(V)
- (h) Flash point : Not applicable
- (i) Auto-ignition temperature : 444 °C
- (j) Decomposition temperature : Stable under normal conditions.
- (k) pH : neutral
- (l) Viscosity, kinematic : No data available
- (m) Solubility(ies) : Water solubility:
No data available
- (n) Partition coefficient: n-octanol/water : No data available
- (o) Vapour pressure : 871,9 kPa
at 21 °C
- (p) Density and / or relative density : No data available
- (q) Relative vapour density : No data available
- (r) Particle characteristics : No data available

9.2 Other Information

- Polymer characteristics : No data available

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Oxidizing properties : The substance or mixture is not classified as oxidizing.

Evaporation rate : No data available

Viscosity, dynamic : No data available

SECTION 10: Stability and reactivity**10.1. Reactivity**

Stable under normal conditions.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous polymerisation does not occur.

10.4. Conditions to avoid

Do not pierce or burn, even after use. Do not spray on a naked flame or any incandescent material.
Heat, flames and sparks.
Pressurized container. Protect from sunlight and do not expose to temperatures exceeding 50 °C.

10.5. Incompatible materials

Alkali metals
Oxidizers (e.g. peroxide residues present in insufficiently cured rubbers)
Finely divided metal powders such as aluminum, magnesium, or zinc.

10.6. Hazardous decomposition products

In case of fire hazardous decomposition products may be produced such as:
Hydrogen fluoride
Carbonyl halides
Carbon monoxide
Carbon dioxide (CO₂)

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SECTION 11: Toxicological information**11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008****(a) Acute toxicity***Acute oral toxicity:*

No data available

Acute dermal toxicity:

No data available

Acute inhalation toxicity:

No data available

Acute toxicity (other routes of administration):

No data available

(b) Skin corrosion/irritation:

No data available

(c) Serious eye damage/eye irritation:

No data available

(d) Respiratory or skin sensitisation:

No data available

(h) STOT-single exposure:

No data available

(i) STOT - repeated exposure:

No data available

(j) Aspiration hazard:

No data available

11.2. Information on other hazards*Endocrine disrupting properties*

No data available

Other information:

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The product has not been tested. The information is derived from the properties of the individual components.

SECTION 12: Ecological information**12.1. Toxicity***Toxicity to fish:*

No data available

Toxicity to aquatic plants:

No data available

Toxicity to aquatic invertebrates:

No data available

12.2. Persistence and degradability

No data available

12.3. Bioaccumulative potential

No data available

12.4. Mobility in soil

No data available

12.5. Results of PBT and vPvB assessment

No data available

12.6. Endocrine disrupting properties

No data available

12.7. Other adverse effects

No data available

SECTION 13: Disposal considerations**13.1. Waste treatment methods***Product:*

Dispose according to legal requirements.

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Packaging:

Legal requirements are to be considered in regard of reuse or disposal of used packaging materials

Further information:

Provisions relating to waste:

EC Directive 2006/12/EC; 2008/98/EEC

Regulation No. 1013/2006

For personal protection see section 8.

SECTION 14: Transport information**14.1 UN number or ID number**

ADR/RID:3161

IMDG:3161

IATA:3161

14.2 UN proper shipping name

ADR/RID:LIQUEFIED GAS, FLAMMABLE, N.O.S.(R-1234yf, DIFLUOROMETHANE)

IMDG:LIQUEFIED GAS, FLAMMABLE, N.O.S.(R-1234yf,DIFLUOROMETHANE)

IATA:Liquefied gas, flammable, n.o.s.(R-1234yf, Difluoromethane)

14.3 Transport hazard class(es)

ADR/RID:2.1

IMDG: 2.1

IATA: 2.1

14.4 Packaging group

No data available

14.5 Environmental hazards

ADR/RID:no

Marine pollutant: no

14.6 Special precautions for user

IMDG Code segregation group according chapter 3.1.4.4 : NONE,

14.7 Maritime transport in bulk according to IMO instruments

No data available

SECTION 15: Regulatory information**15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

Basis	Value	Remarks
Directive 2012/18/EC SEVESO III	Quantity: 10 t Quantity: 50 t	

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Listed in Regulation : P2: Flammable gases		
Substances of very high concern (SVHC)		This product does not contain substances of very high concern according to Regulation (EC) No Article 57 above the respective regulatory 1907/2006 (REACH), concentration limit of ≥ 0.1 % (w/w).
Regulation (EC) No. 1907/2006, Annex XIV		Not listed
Regulation (EC) No. 1907/2006, Annex XVII Number in Regulation: 40		Listed

Global warming potential :
148

Other inventory information

USA. List of Active Substances on the Toxic Substances Control Act (TSCA) Chemical Substances Inventory, as amended
All substances listed as active on the TSCA inventory

Australian Inventory of Industrial Chemicals
All components are listed on the inventory, regulatory obligations/restrictions apply

Canada. Domestic Substances List (DSL), as amended
All components of this product are on the Canadian DSL

Japan. Kashin-Hou Law List
On the inventory, or in compliance with the inventory

Korea. Existing Chemicals Inventory (KECI)
On the inventory, or in compliance with the inventory

Philippines. Inventory of Chemicals and Chemical Substances (PICCS)
On the inventory, or in compliance with the inventory

China. Inventory of Existing Chemical Substances (IECSC)
On the inventory, or in compliance with the inventory

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Thailand. Existing Chemicals Inventory from FDA (TECI List)
On the inventory, or in compliance with the inventory

Taiwan Chemical Substance Inventory (TCSI)
On the inventory, or in compliance with the inventory

15.2 Chemical safety assessment

A Chemical Safety Assessment has not been carried out.

SECTION 16: Other information**Text of H-statements referred to under heading 3**

2,3,3,3-Tetrafluoroprop-1-ene	:	H280	Contains gas under pressure; may explode if heated.
		H221	Flammable gas.
Difluoromethane	:	H221	Flammable gas.
		H280	Contains gas under pressure; may explode if heated.

Further information

All directives and regulations refer to amended versions.
Vertical lines in the left hand margin indicate a relevant amendment from the previous version.

Abbreviations:

EC European Community
CAS Chemical Abstracts Service
DNEL Derived no effect level
PNEC Predicted no effect level
vPvB Very persistent and very bioaccumulative substance
PBT Persistent, bioaccumulative and toxic substance

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other

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materials or in any process, unless specified in the text. Final determination of suitability of any material is the sole responsibility of the user.

This information should not constitute a guarantee for any specific product properties.

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