HaloPolymer

HALOCARBONS AND SULFUR HEXAFLUORIDE

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1 Halocarbon 14

Tetrafluoromethane
Technical Specifications 301-14-78-920 with amendments 1-4

Chemical formula: CF_4

External characteristics:
colorless gas, low-toxic, chemically inert.

Technical requirements and properties:

Index name	Norm
Volume ration of base material, %, no less	99,2
Cumulative volume ration of low-boiling impurities (nitrogen+oxygen, carbon oxide), %, no more	0,7
Cumulative volume ration of high-boiling impuritie (hexafluoroethane, carbon dioxide)), %, no more	0,1
Water content, mass, % no more	0,001
Boiling point, °C	128

Critical point:

1. temperature - minus 45,65°C,
2. pressure - 3,74 MPa,
3. density - 625 kg/m^3.

Fire risk characteristics: non-inflammable, explosion-proof.

Application:
for plasma etch chemistry of dielectrics in production of integral circuits. As a halocarbon, fire stopping agent, ozone decomposition stabilizer, dilutant in chemical reaction, reagent in getting fluoroorganic products, also for production of carrier gas in deep diving.

2 Halocarbon 21

Dichlorofluoromethane
Technical Specifications 2412-138-05807960

Chemical formula: $CHFCL_2$

External characteristics:
colorless gas, low-toxic, has slight smell of chloroform.

Technical requirements and properties:

Index name	Norm
Volume ration of base material, %, no more	99,5
Mass content of fixed residue, % no more	0,004
Mass content of impurities, no more	0,5
Water content, mass, % no more	0,005
Ozone Depletion Potential (ODP)	0,04
Boiling point, °C	+ 8,7

Critical point:

1. temperature - +178,45 °C,
2. pressure - 5,190 MPa,
3. density - 528 kg/m^3.

Fire risk characteristics: non-inflammable, explosion-proof

Application: cold carrier for obtaining of temperature about o°C. As a component of service mixtures of cold carrier, propellant, material for polymerization and for fluoroorganic synthesis.

3 Halocarbon 22

Difluorochloromethane

Chemical formula: CF_2ClH

External characteristics: colorless gas, low-toxic.

Technical requirements:

Index name	Norm
Volume ration of base material, %, no less	99,9
Mass content of fixed residue, % no more	0,001
Volume ration of impurities, %, no more	0,1
Water content, mass, %, no more	0,0015
Acidity	Indicator dyeing shall not be changed

Properties:

1. Relative molecular weight – 86,469 g/mol
2. Density of liquid halocarbon at 250C - 1192 kg/m^3
3. Boiling point – minus 40,85 °C
4. Critical temperature - 96,13 °C
5. Critical pressure - 4,986 MPa
6. Critical density - 512,8 kg/m^3
7. Ozone Depletion Potential (ODP) – 0,057

Fire risk characteristics: non-inflammable, explosion-proof.

Application: Cold carrier of chilling machines, commercial and apartment air conditioner, component of mixed cold carriers, propellant, steam generator for obtaining of foam plastic, material in organic synthesis.

Transportation: In balloons and containers by all means of transport in accordance with rules of transport of dangerous goods, effective for this mean of transport, and rules for design and safe operation of pressure vessels, approved by Rostekhnadzor (Federal Environmental, Engineering & Nuclear Supervision Agency).

4 Halocarbon 125 ХП (HP)

Pentafluoroethane, R125
Technical Specifications 8502-93

Chemical formula: C_2F_5H.

External characteristics: colorless gas, low-toxic.

Technical requirements and properties:

Index name	Norm
Mass content of base material in fluid phase, %, no less	99,5
Mass content of air, %, no more	0,02
Mass content of organic impurities, no more	0,5
Water content, mass, %, no more	0,001
Mass content of fixed residue, %, no more	0,01
Acidity in equivalent of hydrofluoric acid in mass content, %, no more	0,0001
Relative molecular weight	120,02
Density at 20°C,kg/m³	1127.
Boiling point at pressure 0,1 MPa, °C	minus 48,5

Critical point:

1. temperature - +67,7 °C ,
2. pressure - 3,39 MPa,
3. density - 529 kg/m^3.

Fire risk characteristics: non-inflammable.

Application: Cold carrier having good firefighting properties, used in gas-extinguishing installations. The product has fire ad sanitary certificates, and also a Certificate of Russian Maritime Industry Register of Shipping. Does not destroy ozone layer.

5 Halocarbon 218

Octafluoropropane

Chemical formula: C_3F_8

External characteristics: colorless gas, chemically inert.

Technical requirements:

Name	Meaning 1		Meaning 2	
	Grade A	Grade B	Quality 1	Quality 2
Volume ration of base material, %, no more	99,92	99,8	99,96	99,0
Volume ration of impurities, %, no more	0,04	0,2	0,04	1,0
Including pentafluorochloroethane , %, no more	0,04	0,2	–	–
Water content, mass, %, no more	0,001	0,002	0,001	0,002
Mass content of fixed residue, %, no more	0,002	Not normalized	0,002	0,002
Acidity	0,0001	0,0005	–	–
Mass content of acids in equivalent of HF, %, no more	–	–	0,0001	0,0001

Properties:

1. Relative molecular weight – 188,02
2. Density of liquid halocarbon at 20 oC - 1408 kg/m^3
3. Boiling point – minus (37,5±0,5) °C
4. Critical temperature – (71,9±0,2) °C
5. Critical pressure - 2,59 MPa
6. Critical density - 628 kg/m^3
7. Ozone Depletion Potential (ODP) - 0

Fire risk characteristics: non-inflammable, explosion-proof.

Application:
Cold carrier, gas dielectric, firefighting agent, propellant, reagent for dry etching in micro.

Transportation: in balloons and containers by motor transport or by railway in accordance with rules of transport of dangerous goods, effective for this mean of transport, and rules for design and safe operation of pressure vessels, approved by Rostekhnadzor.

6 Halocarbon C318

Octafluorobutene

Chemical formula: C_4F_8

External characteristics: Gas without color and smell, liquefied under pressure

Technical requirements:

Name	Meaning		
	Superior quality	Quality 1	Quality 2
Mass content of base material, %, no less	99,9	99,8	90
Mass content of impurities, %, no more	0,1	0,2	8
Volume ration of perfluoropropylene, %, no more	-	-	2
Acidity	Indicator dyeing shall not be changed		

Properties:

1. Relative molecular weight – 200,031
2. Density of liquid halocarbon at 200C, kg/m^3 – 1520
3. Boiling point, oC – minus 6
4. Critical temperature - 115,22^{o}C
5. Critical pressure - 2,778 MPa
6. Critical density - 616 kg/m^3
7. Minimal volume firefighting concentration in distinction of n-heptane, % vol. - 6,6
8. Phlegmatize concentration for methane-air mixture, % vol. – 12,1
9. Ozone Depletion Potential (ODP) - O

Fire risk characteristics: Not easily combustible, explosion-proof

Application:
As a cold carrier and coolant in air conditioners, heat pump units and various heat engines, propellant of aerosol packs. Has excellent firefighting properties, used in gas-extinguishing installations. The product is certified by All-Russian Research Institute for Fire Protection of Ministry of Internal Affairs of the Russian Federation. Does no destroy ozone screen.

Transportation: in balloons and containers by moto transport or by railway in accordance with rules of transport of dangerous goods, effective for this mean of transport, and rules for design and safe operation of pressure vessels, approved by Rostechnadzor

7 Halocarbon 142B

1,1-difluoro-1-chloroethane

Chemical formula: $C_2F_2ClH_3$.

External characteristics:
colorless gas with slight smell, marginally hazardous (low-toxic).

Technical requirements:

Name	Norm
Volume ration of base material, % no less	99,95
Volume ration of methyl fluoroform , %, no more	0,01
Volume ration of fluorochlorovinylidene, %, no more	0,01
Volume ration 1,1- difluoroethane, %, no more	0,015
Volume ration 1-fluoro-1,1- dichloroethane, %, no more	0,01
Volume ration chloroethane, %, no more	0,02
Volume ration of other impurities, defined with chromatography, %, each not more	0,01
Volume ration of oxygen in gaseous phase, %, no more	0,03
Water content, mass, %, no more	0,004
Mass content of fixed residue, %, no more	0,003
Acidity	Indicator dyeing shall not be changed
Notes– content of base material is given without considering noncondensable impurities (O2 + N2)	

Properties:

1. Relative molecular weight – 100,495
2. Ozone Depletion Potential (ODP) – 0,065,
3. Boiling point – minus 9,2 °C,
4. Critical temperature - +136,45 °C,
5. Critical pressure - 4,138 MPa,
6. Critical density - 459 kg/m^3,
7. Density of liquid halocarbone at 20°C – 1113 kg/m^3,
8. Saturated vapor pressure at 20°C – 0,2904 MPa.

Fire risk characteristics: explosive and inflammable

Application: cold carrier, solvent, propellant of aerosol packs, steam generator for obtaining of foam plastic, material for organic synthesis.

Transportation: in balloons and containers by motor or river transport or by railway in accordance with rules of transport of dangerous goods, effective for this mean of transport, and rules for design and safe operation of pressure vessels, approved by Rostechnadzor.

8 Mixture of halocarbons 22 and 142B

External characteristics: Colorless gas, marginally hazardous (low-toxic).

External characteristics:

Index name	Meaning for grade		
	MH	KZh	PR
Mass content of halocarbone 22, %	60±1	65±1	40±1
Mass contentof halocarbon 142B, %	40±1	35±1	60±1
Mass content of noncondensable impurities (air) in liquid phase, %, no more	0,2	–	–
Acidity	Indicator dyeing shall not be changed		
Mass content of fixed residue, %, no more	0,003	0,01	0,01
Water content, mass, %, no more	0,003	0,004	0,004
Note – in agreement with consumers a mixture with other content of halocarbons22 and 142B can be produced			

Properties of halocarbon 142B:

1. Relative molecular weight – 100,495
2. Density of liquid halocarbon at 200C – 1113 kg/m^3
3. Boiling point, oC – minus 9,2^{o}C
4. Critical temperature - +136,45^{o}C
5. Critical pressure- 4,138 MPa
6. Critical density – 459 kg/m^3
7. Saturated vapor pressure at 200C - 0,2904 MPa
8. Ozone Depletion Potential (ODP) – 0,065

Properties of halocarbon 22:

1. Relative molecular weight – 86,469
2. Density of liquid halocarbon at 250C - 1192 kg/m^3
3. Boiling point, – minus 40,85 °C
4. Critical temperature - +96,13 °C
5. Critical pressure - 4,986 MPa
6. Critical density - 512,8 kg/m^3
7. Ozone Depletion Potential (ODP) – 0,057

Fire risk characteristics: non-inflammable, explosion-proof.

Application: cold carrier, propellant, steam generator and special solvent.

Transportation: in balloons and containers by all means of transport in accordance with rules of transport of dangerous goods, effective for this mean of transport, and rules for design and safe operation of pressure vessels, approved by Rostekhnadzor.

9 Sulfur hexafluoride low SPONH

Chemical formula: SF_6 (sulfur hexafluorinated)

Apperance:
in usual conditions - a heavy gas without color and smell, noncombustible, zero-valent.

Application: widely used in the power industry as a dielectric, in electronic and metallurgical industries - as a process medium. It has good fire extinguishing properties. It is used in gas fire extinguishing installations. Certified and approved for use Russian FSRI Ministry of the Interior.

Specifications

Indicator name	Norm	
	Extra pure grade	Low SPONH
Sulphur hexafluoride weight percentage (sulfur), %, not less	99,99	99,9
Contaminants weight percentage: oxygen, nitrogen, tetrafluoromethane (summarily), %, no more; including tetrafluoromethane, %, no more	 0,01 0,005	 0,1 0,05
Water weight percentage, %, no more	0,0005	0,0015
Acids weight percentage calculated as hydrogen fluoride, %, no more	0,00002	0,00003
Hydrolysable fluorides weight percentage calculated as hydrogen fluoride, %, no more	0,0001	0,0001
Toxicological characteristics*	Non toxic	Non toxic

* Toxicity testings are underway on white mice.
The manufacturer shall issue a conclusion about the finished product non-toxicity.

Sulfur hexafluoride low SPONH Technical Specifications 6-02-1249-83 with changes 1-6 are up to quality IEC 60376:2005.

Packaging: balloons with a capacity of 40 dm3, containers with a capacity of 950 dm3, and other vessels rated at operating pressure of at least 1,6 MPa.

Srorage: Warranty period of storage - 5 years from the date of manufacture.

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