

Fluororesin Products for Manufacturing Processes of ultra-pure chemical solutions for semiconductor.

Lining tank (PTFE), lining piping (PTFE, PFA), lining valve (PTFE, PFA), insertion tube (PTFE, PFA), gasket (PTFE), bellows (PTFE, PFA)

Flexible hose (PTFE, PFA), pliable hose (PTFE, PFA)

- PFAS used in the products is PTFE and PFA, which are polymer materials, and there is no concern about exposure, leakage, or environmental release of eluates.

(Reference: SDS of PTFE in Daikin Industries, SDS of PFA in Daikin Industries, attached 1,2)

- This product is to be used under the following conditions.

Subject to use: Wetted parts of the devices for storage, transportation, supply, dripping, jet and etc. in various ultra-pure chemicals solutions for semiconductor.

Fluid to be used: Hydrofluoric acid, Sulfuric acid,
Nitric acid, Hydrogen peroxide solution, Hydrochloric acid,
Acetic acid, Phosphoric acid, Ammonia+TMAH, Photoresist, etc.

Usage Environment: RT~150°C

Use Conditions: Not to be affected by fluids in the use environment and no leakage.
No elution of metal ions in chemicals

Required to meet the above specification conditions, and no perfect alternative product is considered to be available at this time,

(Reference: Plastic Data Handbook Kogyo Chosakai Publishing Co., Ltd. attached 3,4, VALQUA Handbook Technical Section, attached 5)

- As mentioned above, the presence of fluororesin product is essential for chemicals used in manufacturing processes of ultra-pure chemicals solutions for semiconductor.

- The most of them are used for the manufacturing process of semiconductor as essential materials. Semiconductor market size reaches 600 billion dollar. If they were prohibited to use, it has a huge impact for the society and economy.

- We propose a regulatory exemption for the above reasons.

Attachment 1: PTFE Safety Date Sheet



Safety data sheet

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Printing date 06.02.2023

Version number 1

Revision: 06.02.2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

Article number: M

1.2 Relevant identified uses of the substance or mixture and uses advised against:
No further relevant information available.

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier:

DAIKIN INDUSTRIES, LTD. CHEMICALS DIVISION:

OSAKA UMEDA TWIN TOWERS SOUTH, 1-13-1 Umeda, Kita-ku, Osaka-shi, Osaka, 530-0001, Japan

Phone: [REDACTED]

Fax: [REDACTED]

Further information obtainable from: <http://www.daikin.com/>

1.4 Emergency telephone number:

Japan:

China: [REDACTED] +86-21-34151689

South Korea:

Americas: CHEMTREC [REDACTED] (Outside US/Canada: [REDACTED])

Europe: +49-211-179 225-0

SECTION 2: Hazard identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

The substance is not classified, according to the CLP regulation.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008: Not applicable

Signal word: Not applicable

SECTION 3: Composition/information on ingredients

Information on ingredients:

CAS: 9002-84-0 Polytetrafluoroethylene

100%

SECTION 4: First aid measures

4.1 Description of first aid measures

General information: Seek medical treatment.

After inhalation: In case of inhaling decomposed gases: supply fresh air and consult a doctor in case of complaints.

After skin contact:

Immediately wash with water and soap and rinse thoroughly.

After contact with the molten product, cool rapidly with cold water.

Do not pull solidified product off the skin.

After eye contact:

Rinse opened eye for several minutes under running water.

Consult an ophthalmologist in case of complaints.

After swallowing: If symptoms persist consult a doctor.

4.2 Most important symptoms and effects, both acute and chronic: No further relevant information available.

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

No further relevant information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents: Use fire extinguishing methods suitable for surrounding conditions.

For safety reasons unsuitable extinguishing agents: No further information available.

5.2 Special hazards arising from the substance or mixture:

Formation of toxic gases is possible during heating or in case of fire.



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Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

5.3 Advice for firefighters:

Protective equipment:

Wear self-contained breathing apparatus and protective suit.

Do not inhale explosion gases or combustion gases.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation before entering the area.

Keep out unauthorized persons.

Wear appropriate protective devices (See Section 8 Exposure Controls/Personal Protection).

Avoid contact with eyes and skin.

Do not swallow the product.

6.2 Environmental precautions: Do not allow product to reach sewage system or any water course.

6.3 Methods and material for containment and cleaning up: Pick up mechanically.

6.4 Reference to other sections:

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling:

Ensure good ventilation/exhaustion at the workplace.

Extractors are required on all machines used for thermal processing or powder handling processes.

Do not handle until all safety precautions have been read and understood.

Information about fire - and explosion protection: Keep ignition sources away - Do not smoke.

7.2 Conditions for safe storage, including any incompatibilities:

Storage

Requirements to be met by storerooms and receptacles: Store in a cool and dry location.

Information about storage in one common storage facility:

Store away from oxidising agents.

See section 10 for information on incompatible materials.

Further information about storage conditions:

Protect from heat and direct sunlight.

Store containers in a well ventilated area.

7.3 Specific end use(s): No further relevant information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters No further information available.

Ingredients with limit values that require monitoring at the workplace: Not required.

8.2 Exposure controls

Individual protection measures, such as personal protective equipment

General protective and hygienic measures:

Wash hands before breaks and at the end of work.

Do not eat or drink while working.

Keep away from tobacco products.

Respiratory protection:

Use respiratory protective device with filters for organic and acid gas (or airline respirators in some cases), if the product is heated above 260 °C and toxic gas is formed.

Dust respirator, simplified dust respirator

Hand protection



Protective gloves

Material of gloves: Rubber



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Revision: 06.02.2023

Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

Eye/face protection



Safety glasses

Body protection: Protective work clothing

* SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information

Physical state	Powder
Colour:	Milky-white
Odour:	Odourless
Melting point/freezing point:	320-330 °C
Boiling point or initial boiling point and boiling range	Undetermined.
Flammability	Product is not flammable.
Lower and upper explosion limit	
Lower explosive limit:	No further information available.
Upper explosive limit:	Not determined.
Flash point:	Not applicable.
Decomposition temperature:	480-490 °C (1%TG)
pH	Not applicable.
Viscosity:	
Kinematic viscosity	No further information available.
Solubility	
water:	Insoluble.
Partition coefficient n-octanol/water (log value)	No further information available.
Vapour pressure:	Not applicable.
Density and/or relative density	
Density:	Not determined.
Relative density	2.1-2.2
Vapour density	No further information available.
Particle characteristics	No further information available.

9.2 Other information:

Form:	Powder
Auto-ignition temperature:	Product is not self-igniting.

Information with regard to physical hazard classes

Explosives	Not applicable
Flammable gases	Not applicable
Aerosols	Not applicable
Oxidising gases	Not applicable
Gases under pressure	Not applicable
Flammable liquids	Not applicable
Flammable solids	Not applicable
Self-reactive substances and mixtures	Not applicable
Pyrophoric liquids	Not applicable
Pyrophoric solids	Not applicable
Self-heating substances and mixtures	Not applicable
Substances and mixtures, which emit flammable gases	
in contact with water	Not applicable
Oxidising liquids	Not applicable
Oxidising solids	Not applicable
Organic peroxides	Not applicable
Corrosive to metals	Not applicable
Desensitised explosives	Not applicable



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Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

SECTION 10: Stability and reactivity

10.1 Reactivity No further relevant information available.

10.2 Chemical stability

Thermal decomposition / conditions to be avoided:

Even at the temperatures reached during the normal hot processing of fluoropolymers, fume that presents a potential health hazard may be generated.

To avoid thermal decomposition do not overheat.

10.3 Possibility of hazardous reactions: No dangerous reactions known under normal conditions of use.

10.4 Conditions to avoid: Keep away from heat, sparks, flame, high temperature.

10.5 Incompatible materials:

Metal powder (e.g. Al, Mg) and fluorine oxidizer. There is a danger of chemical reactions that could cause fire or explosion when the product is heated with them.

10.6 Hazardous decomposition products:

As for decomposition products, particulate matters and extremely toxic/corrosive fumes may be generated (HF, carbonyl fluoride, monomers, perfluoroisobutylene).

Decomposition products differ depending on the temperature and conditions.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity no data

LD/LC50 values relevant for classification: No further information available.

Skin corrosion/irritation No further information available.

Serious eye damage/irritation No further information available.

after inhalation: No further information available.

Respiratory or skin sensitisation Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

Carcinogenicity Based on available data, the classification criteria are not met.

Reproductive toxicity Based on available data, the classification criteria are not met.

STOT-single exposure Based on available data, the classification criteria are not met.

STOT-repeated exposure Based on available data, the classification criteria are not met.

Aspiration hazard Based on available data, the classification criteria are not met.

Other information (about experimental toxicology): No further information available.

Subacute to chronic toxicity No further information available.

Additional toxicological information:

General effects:

Fumes generated during burning may cause "polymer fume fever" (flu-like symptoms such as fever, chill, cough).

This may last for a whole day and night.

Fumes are not absorbed in skin. No sensitizing effect known.

Effects of hydrogen fluoride:

Low concentration of hydrogen fluoride may cause feeling of dyspnea, cough, irritation in eyes, nose, throat, fever, chill for 1-2 days.

After that, dyspnea, cyanosis and pulmonary edema may be seen.

High concentration of hydrogen fluoride damages liver and kidney.

Effects of carbonyl fluoride:

Skin: Irritation or eruption

Eye: Ulcer in cornea, conjunctiva

Respiratory system: Irritation

Lung: Temporary symptoms such as cough, pain, dyspnea

Persons who have experienced lung diseases are vulnerable to toxicity caused by excessive exposure to pyrolysis products

11.2 Information on other hazards

Endocrine disrupting properties

Substance is not listed.



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Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

* SECTION 12: Ecological information

12.1 Toxicity

Aquatic toxicity: No further relevant information available.

12.2 Persistence and degradability: The product is thought to be non-biodegradable.

Other information: The product is slightly biodegradable.

12.3 Bioaccumulative potential: No further relevant information available.

12.4 Mobility in soil: No further relevant information available.

12.5 Results of PBT and vPvB assessment

PBT: No further relevant information available.

vPvB: No further relevant information available.

12.6 Endocrine disrupting properties The product does not contain substances with endocrine disrupting properties.

12.7 Other adverse effects: No further relevant information available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Recommendation:

Landfill disposal is recommended.

In case of incineration, the temperature must be higher than 800 °C.

Treat exhaust gas such as HF in a suitable way.

Disposal must be made according to official regulations.

Uncleaned packaging

Recommendation: Disposal must be made according to official regulations.

* SECTION 14: Transport information

14.1 UN number or ID number

ADR, ADN, IMDG, IATA

Not applicable

14.2 UN proper shipping name:

ADR, ADN, IMDG, IATA

Not applicable

14.3 Transport hazard class(es):

ADR, ADN, IMDG, IATA

Class:

Not applicable

14.4 Packing group:

ADR, IMDG, IATA

Not applicable

14.5 Environmental hazards:

Marine pollutant:

No

14.6 Special precautions for user:

Not applicable.

14.7 Maritime transport in bulk according to IMO

instruments

Not applicable.

Transport/Additional information:

Avoid direct sunlight. Make sure of no damage, corrosion, leaks on the receptacles.

Take necessary measures for preventing cargo shift.

UN "Model Regulation":

Not applicable

* SECTION 15: Regulatory information

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

No further relevant information available.

Labelling according to Regulation (EC) No 1272/2008 Not applicable

Hazard pictograms Not applicable

Signal word Not applicable

Hazard statements Not applicable

National regulations No further information available.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.



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Trade name: POLYFLON PTFE M-12, 18, 18F, 391S, 392, 393

SECTION 16: Other information

The product is for the industrial use only. We do not guarantee the safety in case the product is used for the other purposes. When using the product for health-care application or food/feed application, consult us in advance. This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Department issuing SDS: EHS Department

Contact: <http://www.daikin.com/>

Abbreviations and acronyms:

RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)

IATA-DGR: Dangerous Goods Regulations by the "International Air Transport Association" (IATA)

ICAO: International Civil Aviation Organisation

ICAO-TI: Technical Instructions by the "International Civil Aviation Organisation" (ICAO)

ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonised System of Classification and Labelling of Chemicals

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent and very Bioaccumulative

*** Data compared to the previous version altered.**

Attachment 2: PFA Safty Date Sheet



Safety data sheet

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Printing date 06.02.2023

Version number 1

Revision: 06.02.2023

* SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name: NEOFロン PFA AP-201, 202, 210, 220, 230, 201SH, 211SH, 215SH, 221SH, 230SH, 231SH

Article number: AP2 STD

1.2 Relevant identified uses of the substance or mixture and uses advised against:
No further relevant information available.

1.3 Details of the supplier of the safety data sheet

Manufacturer/Supplier:

DAIKIN INDUSTRIES, LTD. CHEMICALS DIVISION:

OSAKA UMEDA TWIN TOWERS SOUTH, 1-13-1 Umeda, Kita-ku, Osaka-shi, Osaka, 530-0001, Japan

Phone: [REDACTED]

Fax: [REDACTED]

Further information obtainable from: <http://www.daikin.com/>

1.4 Emergency telephone number:

Japan:

China: [REDACTED], +86-21-34151689

South Korea:

Americas: CHEMTREC [REDACTED] (Outside US/Canada: +1-703-527-3887)

Europe: +49-211-179 225-0

SECTION 2: Hazard identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

The product is not classified, according to the CLP regulation.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008: Not applicable

Signal word: Not applicable

SECTION 3: Composition/information on ingredients

Information on ingredients:

CAS: 26655-00-5 Perfluoro(alkoxy alkane)

100%

Additional information: For the wording of the listed hazard phrases refer to section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures

General information: Seek medical treatment.

After inhalation: In case of inhaling decomposed gases: supply fresh air and consult a doctor in case of complaints.

After skin contact:

Immediately wash with water and soap and rinse thoroughly.

After contact with the molten product, cool rapidly with cold water.

Do not pull solidified product off the skin.

Consult a doctor in case of complaints.

After eye contact:

Rinse opened eye for several minutes under running water.

Consult an ophthalmologist in case of complaints.

After swallowing: If symptoms persist consult a doctor.

4.2 Most important symptoms and effects, both acute and chronic: No further relevant information available.

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

No further relevant information available.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents: Use fire extinguishing methods suitable for surrounding conditions.

For safety reasons unsuitable extinguishing agents: No further information available.

5.2 Special hazards arising from the substance or mixture:

Formation of toxic gases is possible during heating or in case of fire.



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Trade name: NEOFロン PFA AP-201, 202, 210, 220, 230, 201SH, 211SH, 215SH, 221SH, 230SH, 231SH

5.3 Advice for firefighters:

Protective equipment:

Wear self-contained breathing apparatus and protective suit.

Do not inhale explosion gases or combustion gases.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation before entering the area.

Keep out unauthorized persons.

Wear appropriate protective devices (See Section 8 Exposure Controls/Personal Protection).

Avoid contact with eyes and skin.

Do not swallow the product.

6.2 Environmental precautions: Do not allow product to reach sewage system or any water course.

6.3 Methods and material for containment and cleaning up: Pick up mechanically.

6.4 Reference to other sections:

See Section 8 for information on personal protection equipment.

See Section 13 for disposal information.

SECTION 7: Handling and storage

7.1 Precautions for safe handling:

Ensure good ventilation/exhaustion at the workplace.

Extractors are required on all machines used for thermal processing or powder handling processes.

Do not handle until all safety precautions have been read and understood.

Information about fire - and explosion protection: Keep ignition sources away - Do not smoke.

7.2 Conditions for safe storage, including any incompatibilities:

Storage

Requirements to be met by storerooms and receptacles: Store in a cool and dry location.

Information about storage in one common storage facility:

See section 10 for information on incompatible materials.

Further information about storage conditions:

Protect from heat and direct sunlight.

Store containers in a well ventilated area.

7.3 Specific end use(s): No further relevant information available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters No further information available.

Ingredients with limit values that require monitoring at the workplace:

The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

8.2 Exposure controls

Appropriate engineering controls No further data; see item 7.

Individual protection measures, such as personal protective equipment

General protective and hygienic measures:

Wash hands before breaks and at the end of work.

Do not eat or drink while working.

Keep away from tobacco products.

Respiratory protection:

Use respiratory protective device with filters for organic and acid gas (or airline respirators in some cases), if the product is heated above 260 °C and toxic gas is formed.

Dust respirator, simplified dust respirator

Hand protection



Protective gloves

Material of gloves: Rubber

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Trade name: NEOFロン PFA AP-201, 202, 210, 220, 230, 201SH, 211SH, 215SH, 221SH, 230SH, 231SH

Eye/face protection



Safety glasses

Body protection: Protective work clothing

* SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information

Physical state	Powder
Colour:	Whitish
Odour:	Odourless
Odour threshold:	Not determined.
Melting point/freezing point:	300 °C
Boiling point or initial boiling point and boiling range	Undetermined.
Flammability	Not determined.
Lower and upper explosion limit	
Lower explosive limit:	No further information available.
Upper explosive limit:	Not determined.
Flash point:	Not applicable.
Decomposition temperature:	No further information available.
pH	Not applicable.
Viscosity:	
Kinematic viscosity	Not applicable.
Dynamic:	Not applicable.
Solubility	
water:	Not miscible or difficult to mix.
Partition coefficient n-octanol/water (log value)	No further information available.
Vapour pressure:	No further information available.
Density and/or relative density	
Density at 25 °C:	2.1-2.2 g/cm ³
Relative density	Not determined.
Vapour density	Not applicable.
Particle characteristics	No further information available.

9.2 Other information:

Form:	Pellets
Auto-ignition temperature:	Product is not self-igniting.
Explosive properties:	Product does not present an explosion hazard.
Evaporation rate	Not applicable.

Information with regard to physical hazard classes

Explosives	Not applicable
Flammable gases	Not applicable
Aerosols	Not applicable
Oxidising gases	Not applicable
Gases under pressure	Not applicable
Flammable liquids	Not applicable
Flammable solids	Not applicable
Self-reactive substances and mixtures	Not applicable
Pyrophoric liquids	Not applicable
Pyrophoric solids	Not applicable
Self-heating substances and mixtures	Not applicable
Substances and mixtures, which emit flammable gases	
in contact with water	Not applicable
Oxidising liquids	Not applicable
Oxidising solids	Not applicable



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Organic peroxides	Not applicable
Corrosive to metals	Not applicable
Desensitised explosives	Not applicable

SECTION 10: Stability and reactivity

10.1 Reactivity No further relevant information available.

10.2 Chemical stability

Thermal decomposition / conditions to be avoided: To avoid thermal decomposition do not overheat.

10.3 Possibility of hazardous reactions: No dangerous reactions known under normal conditions of use.

10.4 Conditions to avoid: Keep away from heat, sparks, flame, high temperature.

10.5 Incompatible materials:

Metal powder (e.g. Al, Mg) and fluorine oxidizer. There is a danger of chemical reactions that could cause fire or explosion when the product is heated with them.

10.6 Hazardous decomposition products:

As for decomposition products, particulate matters and extremely toxic/corrosive fumes may be generated (HF, carbonyl fluoride, monomers, perfluoroisobutylene).

Decomposition products differ depending on the temperature and conditions.

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity Based on available data, the classification criteria are not met.

LD/LC50 values relevant for classification: No further information available.

Skin corrosion/irritation No further information available.

Serious eye damage/irritation No further information available.

after inhalation: No further information available.

Respiratory or skin sensitisation Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

Carcinogenicity Based on available data, the classification criteria are not met.

Reproductive toxicity Based on available data, the classification criteria are not met.

STOT-single exposure Based on available data, the classification criteria are not met.

STOT-repeated exposure Based on available data, the classification criteria are not met.

Aspiration hazard Based on available data, the classification criteria are not met.

Other information (about experimental toxicology): No further information available.

Subacute to chronic toxicity No further information available.

Additional toxicological information:

General effects:

Fumes generated during burning may cause "polymer fume fever" (flu-like symptoms such as fever, chill, cough).

This may last for a whole day and night.

Fumes are not absorbed in skin. No sensitizing effect known.

Effects of hydrogen fluoride:

Low concentration of hydrogen fluoride may cause feeling of dyspnea, cough, irritation in eyes, nose, throat, fever, chill for 1-2 days.

After that, dyspnea, cyanosis and pulmonary edema may be seen.

High concentration of hydrogen fluoride damages liver and kidney.

Effects of carbonyl fluoride:

Skin: Irritation or eruption

Eye: Ulcer in cornea, conjunctiva

Respiratory system: Irritation

Lung: Temporary symptoms such as cough, pain, dyspnea

Persons who have experienced lung diseases are vulnerable to toxicity caused by excessive exposure to pyrolysis products

11.2 Information on other hazards

Endocrine disrupting properties

None of the ingredients is listed.



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Trade name: NEOFロン PFA AP-201, 202, 210, 220, 230, 201SH, 211SH, 215SH, 221SH, 230SH, 231SH

* SECTION 12: Ecological information

12.1 Toxicity

Aquatic toxicity: No further relevant information available.

12.2 Persistence and degradability: The product is thought to be non-biodegradable.

Other information: The product is insoluble in water and the biodegradation and ecotoxicity is expected to be low.

12.3 Bioaccumulative potential: No further relevant information available.

12.4 Mobility in soil: No further relevant information available.

12.5 Results of PBT and vPvB assessment

PBT: No further relevant information available.

vPvB: No further relevant information available.

12.6 Endocrine disrupting properties For information on endocrine disrupting properties see section 11.

12.7 Other adverse effects:

Ecotoxicological effects: no data

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Recommendation:

Landfill disposal is recommended.

In case of incineration, the temperature must be higher than 800 °C.

Treat exhaust gas such as HF in a suitable way.

Disposal must be made according to official regulations.

Uncleaned packaging

Recommendation: Disposal must be made according to official regulations.

SECTION 14: Transport information

14.1 UN number or ID number

ADR, ADN, IMDG, IATA Not applicable

14.2 UN proper shipping name:

ADR, ADN, IMDG, IATA Not applicable

14.3 Transport hazard class(es):

ADR, ADN, IMDG, IATA Not applicable

Class:

14.4 Packing group: Not applicable

ADR, IMDG, IATA Not applicable

14.5 Environmental hazards:

Marine pollutant: No

14.6 Special precautions for user: Not applicable.

14.7 Maritime transport in bulk according to IMO

instruments Not applicable.

Transport/Additional information: Avoid direct sunlight. Make sure of no damage, corrosion, leaks on the receptacles.

Take necessary measures for preventing cargo shift.

UN "Model Regulation": Not applicable

SECTION 15: Regulatory information

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

No further relevant information available.

Labelling according to Regulation (EC) No 1272/2008 Not applicable

Hazard pictograms Not applicable

Signal word Not applicable

Hazard statements Not applicable

National regulations No further information available.

15.2 Chemical safety assessment: A Chemical Safety Assessment has not been carried out.



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Version number 1

Revision: 06.02.2023

Trade name: NEOFロン PFA AP-201, 202, 210, 220, 230, 201SH, 211SH, 215SH, 221SH, 230SH, 231SH

SECTION 16: Other information

The product is for the industrial use only. We do not guarantee the safety in case the product is used for the other purposes. When using the product for health-care application or food/feed application, consult us in advance. This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Department issuing SDS: EHS Department

Contact: <http://www.daikin.com/>

Abbreviations and acronyms:

ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

GHS: Globally Harmonised System of Classification and Labelling of Chemicals

LC50: Lethal concentration, 50 percent

LD50: Lethal dose, 50 percent

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent and very Bioaccumulative

*** Data compared to the previous version altered.**

Attachment 3: Chemical resistance of various resins

194 1 Basic data

(176) Chemical Resistance of Various Plastics

⊙ Superior: weight change < ±2% ○ Good: 2 to +14%, -2 to -3%

Resin name		Vinyl chloride resin	Vinylidene chloride resin	Polyethylene (low density)
Test conditions		Stress-free condition by 1 month immersion test at 21°C and 60°C unless otherwise specifically mentioned	Stress-free condition by 1 month immersion test at 52°C for disc-shaped samples with 1/8" thick and 2" diameter	Stress-free condition by 1 month immersion test at 52°C for disc-shaped samples with 1/8" x 2"
Environmental agent	Environment			
	1 (High humidity)	⊙	⊙	⊙
	2 (Factory)	⊙	Discolored at high temperatures	⊙
	3 (Ship)	⊙	⊙	⊙
	4 (Countryside)	⊙	⊙	⊙
	5 (Salt spray)	⊙	⊙	⊙
Sulfuric acid		10% 70°C : △, 30% Room temperature ⊙, 98% Room temperature △	98% : △ Discolored, Hardened	Discolored
Nitric acid		Up to 35% : ⊙	65% : ○ Discolored, Hardened	Concentrated: Cracked
Hydrochloric acid		50% 22°C : ⊙, 60°C : ×	35% : ○ Dark brown, Brittle	Slightly discolored
Hydrofluoric acid			48% : ○ Discolored, Hardened	⊙
Chlorine		Dry gas : ⊙, Wet gas : ○	Saturated : ⊙	Slightly discolored
Hydrogen sulfide			Dry gas : ⊙	Barely discolored
Sulfur dioxide				⊙
Arsenic acid		80% : ⊙	Concentrated : ⊙	Concentrated : ⊙
Boric acid			⊙	Saturated : ⊙
Phosphoric acid		70 to 80% : ○, 85% : ×	85% : ×	⊙
Potassium hydroxide			○ Discolored, Hardened	Slightly discolored
Sodium hydroxide		Dry gas : ⊙, Wet gas : ×	50% : ○ Discolored, Hardened	Slightly discolored
Ammonia			×	Slightly swollen
Anhydrous ammonia			Dark color	⊙
Calcium hydroxide		×	×	Significantly brittle
Water		⊙	⊙	⊙
Sodium chloride		⊙	⊙	⊙
Ammonium nitrate		⊙	Saturated: Slightly hardened	⊙
Sodium nitrate		⊙	⊙	⊙
Calcium carbonate		⊙	⊙	⊙
Magnesium carbonate		⊙	⊙	⊙
Calcium chloride		⊙	15% : Dark color, Hardened	⊙
Magnesium chloride		⊙	⊙	⊙
Magnesium nitrate		⊙	⊙	⊙
Magnesium sulfate		⊙	⊙	⊙
Zinc sulfate		⊙	⊙	⊙
Zinc chloride		⊙	⊙	⊙
Sodium hydrogen sulfate		⊙	⊙	⊙
Hydrogen peroxide		⊙	⊙	⊙
Chromic acid		10%, 22.2°C : ⊙, 50% : ×	⊙	50% : ⊙
Potassium dichromate		⊙	⊙	⊙
Acetic acid		10, 80%, 22°C : ⊙	Glacial acetic acid (Slightly brittle)	Slightly swollen
Acetic anhydride		Glacial acetic acid 22°C : ⊙, 60°C : ×	Softened	Slightly swollen
Sodium acetate		×	⊙	Slightly swollen
Formic acid		22°C : ⊙, 60°C : ×	○ : Hardened, Brittle	⊙
Maleic anhydride			⊙	⊙
Citric acid		⊙	⊙	⊙
Fatty acid		⊙	⊙ Turned dark brown	⊙
Phthalic anhydride		×	⊙	⊙
Hydrocarbon			Softened	Swollen, cracked
Alcohol		<96%, 60°C : ⊙	Slightly softened	⊙
Isopropyl alcohol		○	⊙	⊙
Butyl alcohol		⊙	×	Slightly discolored and swollen
Glycerin		⊙	⊙	⊙
Glycol		⊙	⊙	⊙
Ester		×	Softened	Slightly swollen
Ethyl acetate		×	×	Slightly swollen
Ethyl chloride		×	Room temperature : ×	Slightly swollen
Ketone		×	Softened	Slightly swollen
Acetaldehyde		×	⊙	⊙
Urea		⊙	⊙	⊙
Detergent		⊙	Slightly discolored	Soap solution : ⊙
Tar oil		⊙	—	⊙
Rosin		Wood rosin, Room temperature : ×	Wood rosin, Room temperature : ×	Wood rosin, Room temperature : ×
Chlorinated solvent		CCl ₄ : ×	Slightly softened	Swollen

Note: * Use limit temperature is a maximum temperature at which the resin is usable.

△ Acceptable: +14 to +19%, -3 to -4% × Unacceptable: unusable This evaluation is by W.H. Adams

Polypropylene	Polystyrene (for general use)	ABS resin	AS resin
Test results obtained at room temperature unless otherwise specifically mentioned	Immersed at 21°C for 7 days unless otherwise specifically mentioned	Immersed at 21°C for 7 days	Immersed at 21°C for 7 days
2 to 10% 100°C : ○ 100% : × Fume : ×, 50% 60°C : ○ 30% 60°C : ○, 10% 100°C : ○ 38 to 45% 20°C : ○ Dry gas : △, Wet gas : △, Liquid : × Gas, 100°C : ○ 85% 100°C : ○ 30% 20°C : ○ Liquid ○ Total concentration Use limit temperature * : ○ Total concentration, Use limit temperature * : ○ Total concentration, 90°C : ○ Total concentration, Room temperature to 80°C : ○ Total concentration, Use limit temperature * : ○ 30% 20°C : ○, 30% 48.9°C : × 1%, 60°C : ○ 10%, 60°C : ○	10, 50% : ○, Concentrated : × 20, 70% : × 10% : ○, 30% : △ 1% : △, 48% : × × — 50% : ○ 10~30% : ○, Saturated : ○ Saturated : ○ Total concentration Use limit temperature * : ○ 20% : ○	10% : ○ 10% : Slightly affected 10% : ○ 10% : ○, Concentrated : × Anhydrous liquid : × Slightly affected by dry and wet gases. Stained Concentrated : ○ 10% : ○ 10% : ○ Ammonia hydroxide ○ Gas or liquid : × 10% : ○ 6% Slightly affected Slight liquid stain	30% : ○ — 10% : ○ 10% : ○ — Concentrated : ○ 10% : ○ 10% : ○ — 10% : ○ — Concentrated : ○ 10% : ○ 10% : ○ — 6% : ○ — 5% : ○ — 10% : ○ 10% : ○ — Toluene : × Methanol 95% Ethanol : ○ — × × × × — — — △
100% Glacial acetic acid < 20°C : ○ 10% < 60°C : ○ — Total concentration Use limit temperature * : ○ 100% : ○ 10%, 60°C : ○ — 10%, 60°C : ○ △ Benzene : ○ Toluene : × — — Butyl acetate : × △ (Swollen) Room temperature : × Acetone : ○ — Wood rosin, Room temperature : × CCl₄ : ×	5, 25% : ○ Glacial acetic acid : × — 90% : △ — 10% : ○, 20% : △ ○, 60°C : × Benzene, Toluene, Xylene : Dissolved Ethanol : ○ — Dissolved Dissolved × Acetone : ×, MEK : Dissolved △ — CCl₄ : Dissolved Paracol : ×	5% : ○ △* 10% : ○ — 10% : ○ — Toluene: Dissolved Slightly affected by methyl and 95% ethanol Generally dissolved Generally affected	5% : ○ — 10% : ○ — 10% : ○ — Toluene : × Methanol 95% Ethanol : ○ — × × × × — — — △

Resin name		Acrylic resin	Trifluorochloroethylene resin	Tetrafluoroethylene resin
Test conditions		Data obtained at room temperature unless otherwise specifically mentioned	Immersion test at room temperature	At room temperature unless otherwise specifically mentioned
Environmental agent	1 (High humidity) 2 (Factory) 3 (Ship) 4 (Countryside) 5 (Salt spray)			
Environment	1 (High humidity) 2 (Factory) 3 (Ship) 4 (Countryside) 5 (Salt spray)			
Sulfuric acid		Weak acid (60%) : ○, Strong acid : ×		30%, 12 months, 71°C : No weight change ○
Nitric acid		10% Room temperature : △, 10% 70°C : ×, 30% 70°C : ×		10% 24°C : No weight change 71°C : +0.1%
Hydrochloric acid		38%, Room temperature : ○		Room temperature, No weight change at 10% to 20% ○
Hydrofluoric acid		Weak acid (30%) : ○, Strong acid : ×		≤ 60%, Room temperature to 100°C : ○
Chlorine		Dry gas : ○, Wet gas : ×		Dry gas, wet gas, liquid, Use limit temperature * : ○
Hydrogen sulfide				
Sulfur dioxide		Dry gas : ○, Wet gas : ×		
Arsenic acid				
Boric acid				
Phosphoric acid		50% Room temperature : ○, 50% 70°C : △, 75% Room temperature : ○		Total concentration 200°C : ○
Potassium hydroxide				Total concentration Room temperature to 150°C : ○
Sodium hydroxide				Total concentration Room temperature to 150°C : ○
Ammonia		Aqueous solution : ○		(No weight change)
Anhydrous ammonia		Yellowed		Total concentration, Boiling point : ○
Calcium hydroxide				Aqueous solution or lime milk, 100°C : ○
Water				
Sodium chloride				Total concentration, use limit temperature * : ○
Ammonium nitrate				Total concentration, boiling point : ○
Sodium nitrate				Total concentration, use limit temperature * : ○
Calcium carbonate				
Magnesium carbonate				Total concentration, boiling point : ○
Calcium chloride				Total concentration, room temperature to boiling point : ○
Magnesium chloride				Total concentration, room temperature to 150°C : ○
Magnesium nitrate				Total concentration, use limit temperature * : ○
Magnesium sulfate				
Zinc sulfate				Total concentration, use limit temperature * : ○
Zinc chloride				
Sodium hydrogen sulfate				
Hydrogen peroxide		Up to 30% : ○		
Chromic acid		×		Total concentration, room temperature to boiling point : ○
Potassium dichromate				Total concentration, room temperature to boiling point : ○
Acetic acid		Weak acid 15% : △, Strong acid : ×		Boiling point : ○
Acetic anhydride				
Sodium acetate				
Formic acid		Weak acid 30% : ○, Strong acid : ×		
Maleic anhydride				Total concentration, crude cure, room temperature to boiling point : ○
Citric acid				Room temperature ~ 300°C : ○
Fatty acid				
Phthalic anhydride				
Hydrocarbon				
Alcohol		Ethyl alcohol 50% : ○, Methyl alcohol 60% : ○		Benzene, 24°C, 12 months : +0.3% : ○
Isopropyl alcohol				95% ethyl alcohol 48.9°C, 12 months: no weight change
Butyl alcohol		Up to 50% : ○		
Glycerin				Boiling point : ○
Glycol				Pure or aqueous solution, Use limit temperature * : ○
Ester				
Ethyl acetate				24°C, 12 months : +0.5%
Ethyl chloride				Room temperature to boiling point : ○
Ketone				Acetone, boiling point : ○
Acetaldehyde				Total concentration, Room temperature to 100°C : ○
Urea				
Detergent		At low concentration ○ - ○		Soap solution : ○
Tar oil				
Rosin				Wood rosin, Room temperature ~ 150°C : ○
Chlorinated solvent				CCl ₄ , 24°C, 12 months : +0.6%

Resin name		Polyamide	Phenolic resin	Phenoxy resin
Test conditions		Room temperature	Numerical value indicates weight increase after immersion at room temperature for 7	Weight change in 7 days is indicated by (%) Temperature: room temperature
Environmental agent	1 (High humidity)	⊙	⊙	⊙
Environment	2 (Factory)	⊙	⊙	⊙
	3 (Ship)	⊙	⊙	⊙
	4 (Countryside)	⊙	⊙	⊙
	5 (Salt spray)	⊙	⊙	⊙
Sulfuric acid		×	30% : 0.98	38% : 0.21
Nitric acid		×	10% : 1.97	Weight increase, dimension increase
Hydrochloric acid		×	10% : 1.49	10% : 0.25, Weight increase
Hydrofluoric acid		×	≤ 60%, Room temperature to 100°C : ⊙ (Carbon filling)	Concentrated: weight increase in 0.16 Dimension increase in 0% to 0.36%
Chlorine		⊙	Dry gas, wet gas, room temperature to 80°C : ⊙ (Carbon filling)	×
Hydrogen sulfide		⊙	—	⊙
Sulfur dioxide		⊙	No change at room temperature in 72 h	⊙
Arsenic acid		⊙	⊙	⊙
Boric acid		⊙	—	⊙
Phosphoric acid		△ - ×	1 to 85%, Room temperature to 100°C : ⊙	⊙
Potassium hydroxide		⊙	×	⊙
Sodium hydroxide		⊙	1% : 0.85, 10% : 2.78	⊙
Ammonia		⊙	—	—
Anhydrous ammonia		⊙	0% : No weight change	⊙
Calcium hydroxide		×	—	⊙
Water		⊙ (Dimension change occurred)	1.06	⊙ (Absorbed, dimension change occurred)
Sodium chloride		⊙	Total concentration, use limit temperature * : ⊙	⊙
Ammonium nitrate		⊙	⊙	⊙
Sodium nitrate		⊙	Total concentration, use limit temperature * : ⊙	⊙
Calcium carbonate		⊙	—	⊙
Magnesium carbonate		⊙	5% : 1.04	⊙
Calcium chloride		⊙	Total concentration, room temperature to 120°C : ⊙	⊙
Magnesium chloride		⊙	Total concentration, room temperature to 95% : ⊙ (Glass-reinforced)	⊙
Magnesium nitrate		⊙	Total concentration, use limit temperature * : ⊙	⊙
Magnesium sulfate		⊙	—	⊙
Zinc sulfate		⊙	5% : 1.05, 10% : 0.524	⊙
Zinc chloride		⊙	3% : 1.04	⊙
Sodium hydrogen sulfate		Dissolved at high temperature	—	⊙
Hydrogen peroxide		Total concentration, use limit temperature * : ⊙	—	0.4, Dimension change
Chromic acid		×	×	⊙
Potassium dichromate		×	90%, room temperature : △	⊙
Acetic acid		×	5% : 0.98	Swollen, dimension increased
Acetic anhydride		×	—	⊙
Sodium acetate		⊙	25% room temperature : ⊙, 50% room temperature : ⊙	—
Formic acid		×	30% room temperature : ⊙	⊙
Maleic anhydride		△	—	⊙
Citric acid		△	10% : 0.655	⊙
Fatty acid		⊙	—	Stress cracking
Phthalic anhydride		⊙	—	⊙
Hydrocarbon		⊙ (Affected, dimension change occurred)	Toluene : 0.016	Toluene: increase in 8.2
Alcohol		⊙ (Affected)	95% ethanol : 0.041	95% ethanol : 4.3
Isopropyl alcohol		⊙	⊙	Stress cracking
Butyl alcohol		⊙	⊙	Stress cracking
Glycerin		⊙ (Affected)	⊙	Increase in 0.12
Glycol		⊙ (Affected)	⊙	0.03, Dimension change
Ester		⊙	Butyl acetate : ⊙	Swollen
Ethyl acetate		⊙	Methyl acetate : ⊙	Swollen
Ethyl chloride		⊙	0.8%	×
Ketone		⊙	Acetone : 0.086	Swollen
Acetaldehyde		⊙	40%, 60°C : ⊙	—
Urea		⊙	—	⊙
Detergent		⊙	Soap solution : ⊙	Increase in 0.26, Stress cracking
Tar oil		⊙	—	Stress cracking
Rosin		⊙	—	⊙
Chlorinated solvent		⊙	CCl ₄ : 0.906	CCl ₄ : Increase in 0.09

Resin name		Epoxy resin (glass fiber-reinforced)	Diallyl phthalate resin (diallyl diolate resin)	Polyalomer (ethylene-propylene copolymer)
Test conditions		Room temperature unless otherwise specifically mentioned	Room temperature unless otherwise specifically mentioned. Numerical value indicates weight change %	Numerical value obtained after immersion at 23°C in 1 month indicates weight change %
Environmental agent				
Environment	1 (High humidity) 2 (Factory) 3 (Ship) 4 (Countryside) 5 (Salt spray)	⊙ ⊙ ⊙ ⊙ ⊙	⊙ ⊙ ⊙ ⊙ ⊙	⊙ ⊙ ⊙ ⊙ ⊙
Sulfuric acid		10% : ⊙ (Low temperature), ⊙ (High temperature) 70% : ⊙ (Low temperature), × (High temperature) 3% : △ (Low temperature), × (High temperature) 20% : × (Low and high temperatures) Low temperature : ⊙, High temperature : △	30% : 0.48	30% : +0.01
Nitric acid		Low temperature : ⊙, High temperature : ⊙	10% : +1.29	70% : +0.7 Yellowed
Hydrochloric acid		Low temperature : ⊙, High temperature : ⊙	20%, 80°C : ×	10% : +0.1
Hydrofluoric acid		Low temperature : ⊙, High temperature : ⊙	—	—
Chlorine		Low temperature : ⊙, High temperature : ⊙	—	—
Hydrogen sulfide		Low temperature : ⊙, High temperature : ⊙	—	—
Sulfur dioxide		Low temperature : ⊙, High temperature : ⊙	—	—
Arsenic acid		Low temperature : ⊙, High temperature : ⊙	—	—
Boric acid		Low temperature : ⊙, High temperature : ⊙	—	—
Phosphoric acid		Low temperature : ⊙, High temperature : ⊙	50% Room temperature : ⊙, 50% 70°C : ⊙	—
Potassium hydroxide		—	—	—
Sodium hydroxide		≤50%, Room temperature to 80°C : ⊙	5% aqueous solution : ⊙ Alcohol potash (warm) : × 2.26%, 71.1°C : ⊙	10% aqueous solution : +0.01%
Ammonia		Ammonia hydroxide : ⊙	12% aqueous solution : ⊙	—
Anhydrous ammonia		Gas (low temperature) : ⊙ Gas (high temperature) : △, liquid : × Wet : × (low and high temperatures) Dry : ⊙ (low temperature), × (high temperature)	—	—
Calcium hydroxide		—	—	—
Water		—	⊙ (+0.9% in 1 month in distilled water)	—
Sodium chloride		—	—	10% aqueous solution : -0.02%
Ammonium nitrate		—	—	—
Sodium nitrate		Low temperature : ⊙, High temperature : ⊙	—	—
Calcium carbonate		—	—	—
Magnesium carbonate		—	—	—
Calcium chloride		—	—	40% aqueous solution : +0.1%
Magnesium chloride		Low temperature : ⊙, High temperature : ⊙	—	—
Magnesium nitrate		Low temperature : ⊙, High temperature : ⊙	—	—
Magnesium sulfate		Low temperature : ⊙, High temperature : ⊙	—	—
Zinc sulfate		Low temperature : ⊙, High temperature : ⊙	—	—
Zinc chloride		Total concentration, use limit temperature * : ⊙	Total concentration, use limit temperature * : ⊙	—
Sodium hydrogen sulfate		—	—	—
Hydrogen peroxide		Low temperature : ⊙, High temperature : △	1.2% (71°C)	30% : +0.1%
Chromic acid		10%, Room temperature : △	—	—
Potassium dichromate		—	—	—
Acetic acid		10% : ⊙ (Low temperature), △ (High temperature) 75% : △ (Low temperature), × (High temperature)	—	5% : +0.1%
Acetic anhydride		Low temperature : ⊙, High temperature : ⊙	—	—
Sodium acetate		50% Low temperature : ⊙	—	—
Formic acid		Low temperature : ⊙, High temperature : ⊙	—	—
Maleic anhydride		Low temperature : ⊙, High temperature : ⊙	3% : +1.2% (71°C)	10% : +0.1%
Citric acid		Low temperature : ⊙, High temperature : ⊙	—	—
Fatty acid		Low temperature : ⊙, High temperature : ⊙	—	Oleic acid : 0.4 to 0.7%
Phthalic anhydride		Low temperature : ⊙, High temperature : △	0.025% : ⊙	+1 to 20%
Hydrocarbon		Low temperature : ⊙, High temperature : △	+0.2% : ⊙	+0.1%
Alcohol		—	—	—
Isopropyl alcohol		—	—	—
Butyl alcohol		—	—	—
Glycerin		Pure or aqueous solution, Use limit temperature * : ⊙	—	+0.1%
Glycol		—	—	+0.1%
Ester		Methyl acetate, Butyl acetate : △	—	+6 to 10%
Ethyl acetate		—	—	—
Ethyl chloride		—	—	—
Ketone		Low temperature : ⊙, High temperature : △	Slightly swollen : △	2 to 3%
Acetaldehyde		—	—	—
Urea		—	—	—
Detergent		Soap solution : ⊙	—	—
Tar oil		—	—	—
Rosin		—	—	—
Chlorinated solvent		CCl ₄ : ⊙	—	+10 to 20%

1.2 Characteristics of plastics 201

Ethyl cellulose	Acetyl butyl cellulose	Polystyrene (foam)	Polyurethane (foam)
Room temperature	Numerical value obtained at 25°C unless otherwise specifically mentioned. Weight change % in 1 month	Test conducted at 52°C unless otherwise specifically mentioned	Room temperature
	Slightly swollen (not softened) 10% : +1.5%, 20% : Only surface was slightly eroded in 1 year Degraded in 8 months Significantly brittle 10% : 1.4%, Surface was slightly eroded in 1 year 10% : +10% Wet gas : +3% Saturated solution : +6% Gas > 20% 5% : +1.3% 30% : +1.3%, 50% : 1.6% 75% : Degraded in 2 months 1% aqueous solution : 1%, 10% : +1.4% Brittle in 8 months Saturated solution : +1.7% 10% : +1.3% Saturated solution : 0.8% Solid : +0.2% 10% aqueous solution : +1.7% Solid : +0.08%, 10% aqueous solution : 1.5%, Saturated solution : 0.9% 2.5% aqueous solution : 1.5% 40% : +0.4% Total concentration, room temperature to 60°C : ⑤ Saturated solution : +1.6% 1% : +1.3% (38°C, After 3 days) 3% : 1.7%, 5% : 1.4% 6% : +2% (38°C, After 8 days)	Significantly brittle Cell structure was affected Cell structure was affected Room temperature or less : ⑤ Room temperature or less : ⑤ Significantly brittle Cell structure was affected Cell structure was slightly broken Slightly cracked Cell structure was slightly broken	Gradually hydrated Affected by nitrogen oxide Very slowly hydrated Very slowly hydrated Hydrated High concentration : × Hydrated Hydrated Hydrated Dry gas : ⑤ Gradually hydrated Gradually hydrated Hydrated Hydrated Aqueous solution: Hydrated Aqueous solution: Gradually hydrated × Gradually hydrated Dry : ⑤ Gradually oxidized Dry : ⑤ Hydrated Dry : ⑤ Dry : ⑤ Dry : ⑤ Dry : ⑤ Dry : ⑤ Dry : ⑤ Dry : ⑤ Dry : ⑤ Polyester type was oxidized Oxidized High concentration : × Gradually reacted Dry : ⑤ Hydrated Gradually hydrated Room temperature : ⑤ Slightly expanded Expanded a little Swollen a little Expanded a little Expanded a little Expanded a little Swollen Gradually hydrated Slightly expanded
Diluted : ⑤, Concentrated : × Softened	5% : +3%, 10% : +5%, 30% : 14% Degraded 3% : +1.3% (38°C, After 3 days) 10% : +1.6% (60°C, After 4 months) Oleic acid : -2.3% In fatty acid ⑤ - ⑤, Some degraded 15% : +2% > 20% +3.6% +0.03% 0.8% Degraded Degraded Swollen, Degraded	Glacial acetic acid: Softened Cell structure was affected Cell wall was slightly cracked Cell structure was slightly broken Slightly cracked Cell structure was slightly broken	Gradually reacted Dry : ⑤ Hydrated Gradually hydrated Room temperature : ⑤ Slightly expanded Expanded a little Swollen a little Expanded a little Expanded a little Expanded a little Swollen Gradually hydrated Slightly expanded

(Yanagihara: plastics, 22(5), 53(1971))

Attachment 4: Heat resistance of various resins

1.2.16 Heat resistance temperature
(90) Usable temperature of various plastics

1) Long-term heat resistance temperature (90 days or more)

Material	Long-term heat resistance temperature (90 days or more) (°C)	Material	Long-term heat resistance temperature (90 days or more) (°C)
Phenolic resin (no filler)	120 to 130	Methacrylic resin	120 to 130
Unsaturated polyester resin (cast)	90	GP-polystyrene	100
Allyl resin (cast)	90	High pressure polyethylene film	80
Epoxy resin	95 to 100	Molded polyvinyl carbazole	120
Molded polyurethane	110	Polytetrafluoroethylene film	> 250
Hard vinyl chloride resin	80 to 90	Poly trifluorochloroethylene	> 200
Soft vinyl chloride resin	60 to 70	Acetyl cellulose	80
Vinyl chloride vinyl acetate copolymer	80	Ebonite (S = 20%, No filler)	100

Degradation of high molecular materials, p. 237, CORONA PUBLISHING CO., LTD. (1958)

2) Useful temperature

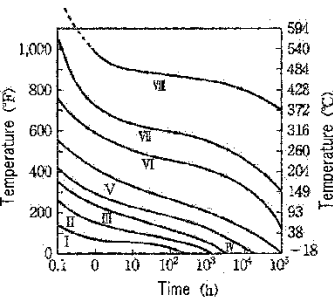
(Unit: °C)

Material	Filler	Repeated use	Continuous use	Material	Filler	Repeated use	Continuous use
Polyester	Glass fiber	135	105	Polytetrafluoroethylene		260	230 to —268
Epoxy resin	Glass fiber	150	120	Poly trifluorochloroethylene		230	200 to —196
ABS resin		80	70 to —20	Polyvinylidene fluoride			150 to —184
High density polyethylene		120	105 to —20	Chlorinated polyether		150	120
Polyvinyl chloride I		75	65 to —40	Polypropylene		150	120

(Gackebach: Chem. Eng. Progr., 59 (10), 96 (1963))

3) Heat resistance classification

Time-temperature relationship diagram for 50% retention of mechanical properties under air heating



Region	Polymer	Region	Polymer
I	Methacrylic resin	III	Polychlorotrifluoroethylene
	Acetyl cellulose		Vinylidene fluoride resin (PVF)
	Nitrocellulose	IV	Alkyd resin
	Polyethylene (low density)		Melamine resin
	Polystyrene		Furfural resin
	Vinyl acetate resin		Polyphenylene oxide (PPO)
	Polyvinyl alcohol		Polysulfone
	Vinyl chloride resin	V	Thermosetting alkyd resin
	AS resin (SAN)		Diallyl dilate resin (DAP)
	SBR		Epoxy resin
II	Urea resin	VI	Phenolic resin
	Polyacetal		Polyester
	ABS resin		Fluorine resin (PTFE)
	Chlorinated polyether	IV	Polybenzimidazole (PBI)
	Ethylene vinyl acetate resin		Polyphenylene
	Furan resin	VII	Silicone
	Polyamide (nylon)		Polyamideimide
	Polycarbonate	VIII	Polyimide
	Polyethylene (high density)		Plastics made of future rigid linear polymer
	Polyethylene terephthalate		
	Polypropylene		
	Vinylidene chloride resin		
	Polyurethane		

(Oishi: plastics , 24 (2), 50 (1973))

Attachment 5: Purity of fluororesin

Elution test example of fluororesin

Eluate: concentrated nitric acid Elution temperature: room temperature

Elution time: 1+6+7 (days)

Processing method: PIFE paste extrusion method

PFA-screw extrusion method

Analytical method: ICP-MS method or flameless atomic absorption spectrometry Unit: ppb

Element	PIFE						PFA					
	No.1			No.2			No.1			No.2		
	1 day	6 days	7 days	1 day	6 days	7 days	1 day	6 days	7 days	1 day	6 days	7 days
H	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Be	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Na	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Al	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ti	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
V	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cr	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mn	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ni	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Co	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cu	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zn	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Ca	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ge	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sr	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Zr	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mo	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ag	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cd	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
In	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sn	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ba	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ta	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tl	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pb	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bi	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fe	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Gr	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	0.1
K	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1