

BOLA Materials

Fluoroplastics

Belong to the family of thermoplastics. The higher the fluorine content, the better the thermal and chemical capacity of fluoropolymers.

Unique properties are:

- » universal chemical resistance
- » high thermal load capacity (-200 °C up to +260 °C)
- » resistance to all sterilisation temperatures
- » non-flammable
- » resistant to environmental changes (weather, light)
- » non-adhesive
- » ultra-low friction coefficient
- » unbreakable
- » physiologically safe
- » inert, no taste, odourless
- » UV-resistant

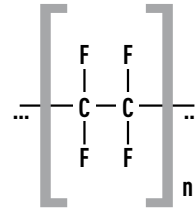
PTFE – Polytetrafluoroethylene

Already discovered in 1938 by research-chemists of DuPont (USA) it was not introduced or marketed until 1946. A partly crystalline fluoroplastic that belongs to the family of thermoplastics (but not suitable for injection moulding).

The remarkable chemical and thermal resistance results from the linkage force between carbon atoms and fluorine atoms and from the nearly complete shielding of the carbon chain by fluorine atoms.

PTFE has a thermal resistance of -260 °C up to +300 °C (for example no brittleness in boiling helium at -269 °C). This temperature range is reached by no other commercial plastic material.

Permanent temperature resistance depends on the load. This means that PTFE can be used from -200 °C to +260 °C at moderate mechanical load. PTFE labware has a white appearance, a non-adhesive surface and excellent slip characteristics. Its fabrication is done by isostatic pressing processes or by machining of extruded semi-finished PTFE material.



Trade name

Teflon®
by DuPont
Hostaflon®
by Dyneon
Fluon®
by ICI Fibres

PTFE – TFM

A further development of the classic Polytetrafluoroethylene (PTFE), with additional modifier Perfluorpropylvinylether.

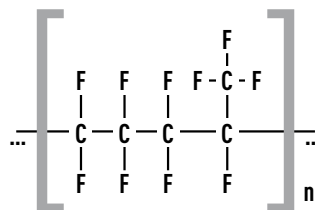
Due to a five times lower molecular weight and a more homogeneous crystal structure, the single particles merge a nearly pore-free polymer structure. Compared to PTFE, the tightness as well as the barrier effect at the same wall thickness are doubled. This is particularly advantageous at high working temperatures. PTFE-TFM has a universal chemical resistance. Sticking of any contaminations is prevented by an extreme smooth surface. Special methods allow a simple and safe heat seal. This material is ideal for e. g. digestion vessels or gaskets.

FEP – Tetrafluoroethylene-Perfluoropropylene

A molten copolymer of tetrafluoroethylene and perfluoropropylene with a high-molecular, partly crystalline structure which was introduced on the market in 1960.

Its mechanical and chemical properties are comparable with those of PTFE, however, the upper limit of the permanent working temperature is lower than that of PTFE (max. +205 °C).

FEP is a typical thermoplastic material which can be treated and machined by using established methods, although its high viscosity limits the speed of operation. FEP labware is translucent to transparent and non-porous.



Trade name

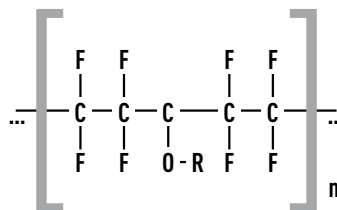
Teflon®
by DuPont
Neoflon®
by Daikin

PFA – Perfluoroalkoxy

Fluorinated hydrocarbon with a high-molecular, partly crystalline structure.

Compared to PTFE it has additional side chains consisting of perfluorinated alkoxy groups. The chemical and thermal properties of this thermoplastic fluoropolymer are equal to those of PTFE.

PFA labware is translucent to transparent, non-porous and particularly useful in high-purity work.



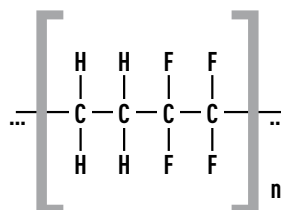
Trade name

Teflon®
by DuPont
Hostafion®
by Dyneon

ETFE – Ethylene-Tetrafluoroethylene

A modified copolymer of ethylene-tetrafluoroethylene. Unlike the homopolymer PTFE which can be treated only by means of pressing or sintering, ETFE can be thermoplastic processed. I. e. this plastic can be injection moulded with appropriate machines.

In laboratories, this material is mainly used for items reinforced with glass fibre such as screw caps or screw joints.



Trade name

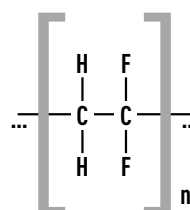
Tefzel®
by DuPont
Hostafion ET®
by Dyneon

PVDF – Polyvinylidene Fluoride

A fluoroplastic that can be machined or thermoplastic processed.

Characterised by a good to excellent chemical resistance. Compared with PTFE, it is much harder and more rigid, but its functional temperature range is lower. Its advantages over other fluoroplastics are its easy processing, the high mechanical values and the low specific weight.

Therefore it is used in many applications.

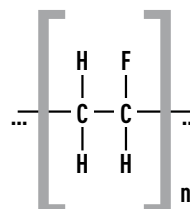


Trade name

Solef®
by Solvay
Dyflor®
by Dynamit

PVF – Polyvinylfluoride

Containing fluorine, it displays a stronger chemical linkage than common polymers and thus a better inherent stability. It shows its unique properties when used at temperatures ranging from -70 °C to +110 °C, whereas temperatures of up to max. +200 °C are withstood. Polyvinylfluoride does not contain any softener, is resistant to fading and can easily be cleaned due to its dirt-repelling surface. In particular, foils, films and bags for gas analysis are made of PVF.



Trade name

Tedlar®
by DuPont

BOLA Materials

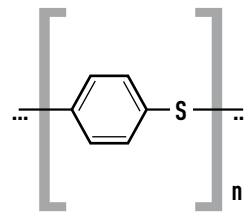
Technical Plastics

Mainly used for high working temperature ranges.
Their best known advantages are:

- » low abrasion
- » no corrosion
- » excellent gliding properties
- » high rigidity
- » good chemical resistance
- » dimensional accuracy
- » high thermal resistance

PPS – Polyphenylsiloxan

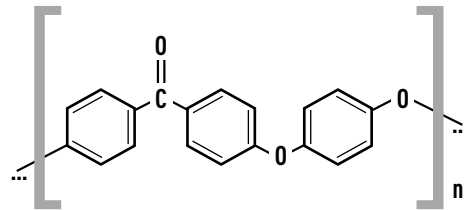
New technical high-performance plastic. This macromolecule consists of phenylene rings and one S-atom which provide a good chemical resistance even at high working temperatures. PPS is particularly suitable for the production of moulded pieces which are exposed to high mechanical and thermal stresses. Injection moulding is the most common processing technology for this material, in addition, single components can be made of semi-finished products by cutting. Special glass-fibre reinforced compounds offer an improved rigidity, sturdiness and dimensional stability under heat compared to non-reinforced compounds.



Trade name
Fortron®
by Hoechst
Ryton®
by Phillips
Petroleum
Chemicals
Alton®
by Intern.
Polymer Corp.

PEEK – Polyetheretherketone

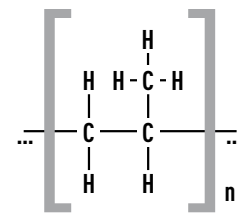
Partly crystalline thermoplastic that withstands high temperatures. Due to its unique properties, PEEK is mainly used for high-value and highly stressable components. The high upper working temperature (+250 °C), the good chemical stability and resistance to hydrolysis as well as the high mechanical values of this material will allow PEEK to become the material of the future. PEEK components are commonly used as HPLC fittings, screw joints or as tubing. Its natural colour is brown, its price is considerably higher than that of PTFE or PFA.



Trade name
Victrex®
by Victrex
Hostatec®
by Hoechst

PP – Polypropylene

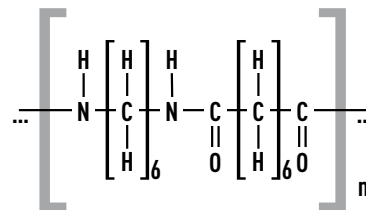
A polymer of ethylene with isotactic arrangement of methyl groups. It does not belong to the family of fluoroplastics. PP can be autoclaved (at +121 °C) and is distinguished by good mechanical and chemical properties almost up to its softening point. PP labware is unbreakable and an economical alternative with, however, restricted chemical and thermal resistance.



Trade name
Norolen®
by BASF
Hostalen®
by BASF

PA – Polyamides

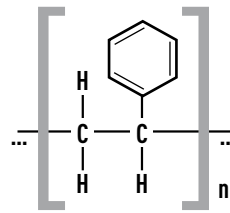
Condensation polymers obtained either from amino acids respectively from their lactams (e. g. caproic lactam) or diamine and dicarboxylic acid (e. g. adipic acid and hexamethylene-diamine). In general, polyamides are defined according to the number of carbon atoms of their monomers, e. g. PA 6 = polycarbonic lactam or PA 12 = polylauric lactam. PA 6 is the most commonly used polyamide. All polyamides are characterised by high strength and scuff resistance. The application range varies from simple turned parts such as screws or nuts to plain bearings or toothed wheels.



Trade name
Ultramid®
by BASF
Durethan®
by Bayer
Grilon®
by Ems Chemie

PS – Polystyrene

A polymerisation product of styrene. Polystyrene is one of the most commonly used plastic materials. For many years it has been processed by injection moulding, extruding or blowing. Because of its structure, it is transparent, hard and brittle. A disadvantage is its low thermal and chemical resistance.

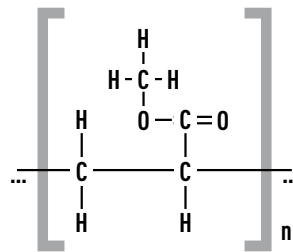


Trade name

Lacqrene®
by ATO
Vestyron®
by Innovene
Edistir®
by Montedison

PMMA – Polymethylmethacrylate

An acrylic resin based on methyl methacrylate. It has become generally known under the trade name Plexiglas®. On the one hand, PMMA is approx. 60 times more elastic than window glass but on the other hand it is approx. 10 times more permeable than silicate glass. Of course, the hardness of its surface does not correspond to that of glass but compared with other materials it can easily be polished to high brilliance. As to weight, Polymethylmethacrylate is much more lightweight than normal window glass.



Trade name

Plexiglas®
by Röhm
Perspex®
by ICI
Oroglas®
by Rohm and Haas

Elastomers

Their main characteristic is their elasticity: Elastomers can easily be stretched and bent and return to their original shape and size after being released. These synthetic materials are most commonly used for o-rings, flat gaskets or resilient elements.

NBR – Acrylonitrile-Butadiene-Caoutchouc

Elastomer on the base of acrylonitrile-butadiene-caoutchouc which is mainly used as budget-priced sealing material (e. g. O-rings for stop-cocks). This material has a good resistance to mineral oils and fats as well as to HFA, HFB and HFC-hydraulic fluids. It has a very good elasticity. PERBUNAN® (its well-known trade name of BAYER AG) is not resistant to brake fluids on the basis of glycol, HFD liquids, aromatic compounds (e. g. Benzole), ester, keton and amines as well as in concentrated acids and caustic solutions. Due to its restricted chemical resistance, PERBUNAN® is not the ideal material for chemistry.

FPM – Fluorocaoutchouc

Elastomer on the base of fluorocaoutchouc, more familiar as VITON® (DuPont). Many O-rings, lip seals and sleeves are made of FPM. It has a very good resistance to heat, chemicals, weather and ozone. Furthermore, it is resistant to sulphurated mineral oils and fats and to hardly inflammable HFD liquids (basis phosphor ester or chlorinated hydrocarbon). It is not resistant to anhydrous ammonia, caustic soda, potassium, ketones, ether, dioxane, as well as some amines and organic acids. For BOLA products, FPM is mainly used as sealing material, mostly protected from the medium by a PTFE sealing lip.

EPDM

EPDM 3 is an elastomer on the base of ethylene-propylene-diene-caoutchouc which is mostly used for gaskets and O-rings. The main applications are in the area of hot water, steam and suds. It is not resistant to hydraulic fluids on the base of mineral oil but it is weather-proof, non-ageing and resistant to ozone. At BOLA, EPDM O-rings are mainly used for applications where VITON® O-rings are not sufficient.

FFKM – Perfluoro-Caoutchouc

An elastic sealing material with natural recovery and good accommodation to the sealing surfaces and a chemical resistance comparable with PTFE. FFKM O-rings have a very high chemical and thermal resistance. Such seals can withstand virtually all kinds of chemicals and can be used at long duration conditions with temperatures up to +260 °C. Perfluoro-caoutchouc is better known under the trade names KALREZ® by DuPont respectively CHEMRAZ® by Greene Tweed.

Materials - Physical Properties

216

TECHNICAL INFORMATION

Property	Standard	Unit	PTFE ¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA ³	PPS	PEEK
Density	DIN 53 479	g/cm ³	2.14-2.19	2.12-2.17	2.12-2.17	1.71-1.78	1.67-1.70	1.75-1.78	0.904-0.907	1.10-1.15	1.04-1.05	1.19	1.65	1.32
Service temperature without loading		°C	250-260	250-260	200-205	150-180	150-180	150-170	90-100	80-100	55-70	80	250	260
Inflammability			non-flammable	non-flammable	non-flammable	self-extinguishing	self-extinguishing	self-extinguishing	flammable	flammable	flammable	yes	self-extinguishing	V-0
Water absorption	DIN 53 495	%	<0.01	0.03	<0.01	<0.1	<0.1	0.03	<0.05	9-10	<0.3	—	0.02	0.5
Transparency			opaque	milky opaque	milky opaque	milky opaque	milky opaque	opaque	milky opaque	milky opaque	transparent	transparent	black	
Radioresistance		MGy	0.006	0.040	0.010	0.030	0.010	0.100	0.020	0.040	10	0.050	—	
Food suitability			Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes	No	
Mechanical	Standard	Unit	PTFE¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA³	PPS	PEEK
Tensile strength 23 °C	DIN 53 456	N/mm ²	29-39	27-32	19-25	36-48	41-54	38-50	25-40	40-60	35-60	72	195	
at 70 °C			—	—	—	—	—	—	18-28	18-28	28-38	35	150	
at 150 °C			14-20	15-21	4-6	8-12	3.5-4.5	7.5-10.5	—	—	—	—	70	
Limit of elasticity 23 °C	DIN 53 455	N/mm ²	10	14	12	24	34	46	25-40	40-80	32-57	—	—	97
Elongation a. tear 23 °C	DIN 53 455	%	200-500	300	250-350	200-500	200-300	20-250	400-800	40-280	2-4	—	1.9	50
Tension E-module 23 °C	DIN 53 457	N/mm ²	400-800	650	350-700	500-1200	1200-1800	800-1800	1100-2100	1600-2000	2900-3500	3300	14700	3600
Limit of bending stress at 23 °C	DIN 53 452	N/mm ²	18-20	15	—	25-30	50	55	45-60	40-60	breaks	—	—	
Bending E-module	DIN 53 457	N/mm ²	600-800	650-700	660-680	1000-1500	1700	1200-1400	800-1500	1000-1600	3000-3400	—	—	
Ball hardness 132/60	DIN 53 456	N/mm ²	25-30	25-30	23-29	34-40	55-65	62-68	58-80	50-80	110-160	—	—	200
Rockwell hardness R	ASIM d-785		—	—	—	45-55	85-95	100-115	—	90-100	—	—	100	99
Shore hardness D	DIN 53 505		55-72	60-65	55-60	63-75	70-80	73-85	70-75	—	—	—	—	
Coefficient of friction dyn. against steel, dry	²		0.05-0.2	0.2-0.3	0.3-0.35	0.3-0.5	0.65	0.2-0.4	0.3-0.5	0.3-0.35	—	0.5	0.4	
Thermal	Standard	Unit	PTFE¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA³	PPS	PEEK
Melting temperature	ASTM 2116	°C	327	300-310	253-282	265-275	240-247	165-178	158-167	215-221	—	—	285	335
Dimensional stability u. heat A (18.5) Kp/cm ³	DIN 53 461	°C	50-60	—	51	71-74	76	80-92	55-60	55-80	70-88	105	—	152
heat B (4,6) Kp/cm ³	DIN ISO R 75		130-140	—	70	104	115	146-150	85-95	165-195	76-100	—	—	
Coeff. of linear thermal expansion		1K x 10 ⁻⁵	10-16	10-16	8-14	8-12	4-8	8-12	15-18	6-12	6-8	7	2.6-4.8	
Thermal conductivity at 23 °C	DIN 52612	W/K x m	0.23	0.22	0.20	0.23	0.15	0.17	0.22	0.21-0.23	0.15-0.16	0.19	0.20	0.25
Specific heat at 23 °C		Kj /Kg x K	1.01	1.09	1.17	1.95	—	1.38	1.68	1.5-2.1	1.18-1.34	—	—	2.16
Oxygen value		%	>95	>95	>95	30	60	43	<30	<30	<30	1.47	56	35
Electrical	Standard	Unit	PTFE¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA³	PPS	PEEK
Dielectric constant at 10 ³	DIN 53 483		2.0-2.1	2.06-2.1	2.1	2.6	2.6	7.8-9.0	2.26-2.4	4-12	2.4-2.74	3.6	4.0	3.2
at 10 ⁵			2.0-2.1	2.06-2.1	2.06-2.1	2.6	2.5	6.4-7.6	2.25	3.5-9	2.5	2.7	4.1	3.2
Dielectric loss factor at 10 ³	DIN 53 483	10 ⁻⁴	0.3-0.5	0.2	2-8	6-8	90	120-200	<4	270-2700	1-20	0.06	2	3.0
at 10 ⁵			0.7-1.0	0.8	2-8	50	90	1500-1900	<5	300-3300	1-14	0.02	20	
Volume resistivity	DIN 53 482	Ω x cm	10 ¹⁸	10 ¹⁸	10 ¹⁸	10 ¹⁶	10 ¹⁵	10 ¹⁴	>10 ¹⁴	10 ¹²	>10 ¹¹	10 ¹⁵	>10 ¹³	5x10 ¹⁶
Surface resistivity	DIN 53 482	Ω	10 ¹⁷	10 ¹⁷	10 ¹⁶	10 ¹⁴	10 ¹⁴	10 ¹³	>10 ¹³	10 ¹⁰	>10 ¹³	5 x 10 ¹³	>10 ¹⁵	10 ¹²
Creep resistance	DIN 53 480		KA3c	—	KA3c	—	—	KA1	KA3c	KA3a-b	KA2-1	600	—	KC 150
Arc resistance	ASTM 495	sec	>360	—	>300	>75	135	>30	—	—	—	—	—	
Dielectric strength	DIN 53 481	KV/mm	40-80	50-80	50-80	60-90	50-80	40-80	60-90	30-80	60-90	30	25-28	25
Gas permeability	Standard	Unit	PTFE¹	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA³	PPS	PEEK
Nitrogen permeability		cm ³ /m ² d/bar	0.7	—	3.8	4.7	1.5	0.06	4.3	0.5	0.27	1	—	
Oxygen permeability		cm ³ /m ² d/bar	2.05	—	30	15.6	0.39	0.05	19	1.2	2.35	1	—	
Carbon dioxide permeability		cm ³ /m ² d/bar	5.7	—	60	38	17	0.2	61	4	8	—	4	
Water vapor permeability		g/m ² /d	0.03	—	2	0.6	9	4.5	2.1	1	14	300	—	

¹ Not extrudable thermoplastic » ² Not a standardised test. Friction coefficient is subject to different effects and can therefore only be used as a guide.
³ Tested partially by methods other than those stated; upon request additional physical characteristics available based on the actual test methods used.

All information stated without engagement.

Materials - Chemical Resistance

Please note:

All information in our catalogue is based on current technical knowledge, experience and manufacturers' data. Users should check the suitability of parts and materials described in the catalogue before purchase.

BOLA does not accept any warranty claims as to suitability and fitness of purpose of the materials and products described in this catalogue. Users should avoid making any assumptions on, or interpretation of, the data herein. **Therefore we cannot provide warranty and cannot accept responsibility for any damage.**

Categories of substances

Classes of substances at +20 °C	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Aldehydes	+	+	+	+	+	+	o	o	-	-
Alcohols	+	+	+	+	+	+	+	-	o	o
Amines	+	+	+	+	+	o	o	o	+	-
Bases/Caustic solutions	+	+	+	+	+	+	+	o	o	-
Esters	+	+	+	+	+	o	+	+	-	-
Ether	+	+	+	o	o	o	o	o	-	-
Glycols	+	+	+	+	+	+	+	+	+	o
Ketones	+	+	+	o	o	o	o	+	-	-
Hydrocarbons, aliphatic	+	+	+	+	+	+	o	+	-	-
Hydrocarbons, aromatic	+	+	+	+	+	+	o	+	-	-
Hydrocarbons, halogenated	o	+	+	+	+	+	o	o	-	-
Mineral oils	+	+	+	+	+	+	-	+	+	o
Oxidizing agents, strong	+	+	+	o	o	+	o	-	-	-
Vegetable oils	+	+	+	+	+	+	o	+	+	o
Acids inorganic	+	+	+	o	o	+	+	-	+	o
Acids organic	+	+	+	o	o	+	+	-	o	+
Lubricating oils	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

- + **Excellent chemical resistance** - continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** - depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** - the plastic material can be deformed or destroyed.

Substances

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Accumulator acid	20	+	+	+	+	+	+	+	-	+	-
Acetaldehyde	100	+	+	+	+	+	+	o	-	-	o
Acetamide	100	+	+	+	+	+	+	+	+	+	o
Acetic acid	100	+	+	+	+	+	+	+	-	o	-
Acetic acid amide	100	+	+	+	+	+	+	+	+	+	o
Acetic acid anhydride	100	+	+	+	+	+	-	o	-	-	-
Acetic acid butyl ester	100	+	+	+	+	+	+	o	+	-	-
Acetic acid chloride	100	+	+	+	+	+	+	o	o	-	-
Acetic acid ethyl ester	100	+	+	+	+	+	-	o	+	-	-
Acetic acid pentyl ester	100	+	+	+	+	+	+	+	+	-	+
Acetic anhydride	100	+	+	+	+	+	-	o	-	-	-
Acetone	100	+	+	+	+	+	-	+	+	-	-
Acetonitrile	100	+	+	+	+	+	o	+	+	-	-
Acetophenone	100	+	+	+	+	+	+	+	-	-	-
Acetyl benzene	100	+	+	+	+	+	+	+	-	-	-
Acetyl chloride	100	+	+	+	+	+	+	o	o	-	-
Acetylene tetrachloride	100	+	+	+	-	-	+	-	+	-	-
Acetylsalicylic acid	100	+	+	+	+	+	+	+	+	+	-
Acetone-2	100	+	+	+	+	+	-	+	+	-	-
Acrylic acid butyl ester	100	+	+	+	+	+	o	o	+	-	-
Acrylic acid ethyl ester	100	+	+	+	+	+	o	o	+	-	-
Acrylonitrile	100	+	+	+	+	+	o	o	+	-	-
Adipic acid	100	+	+	+	+	+	+	+	+	+	-
Alcohol	100	+	+	+	+	+	+	+	-	o	o
Alcohol denatured	100	+	+	+	+	+	+	+	-	o	o
Alkyl acetone	100	+	+	+	+	+	+	+	-	o	-
Alkyl alcohol	100	+	+	+	+	+	+	+	-	o	-
Alkyl chloride	100	+	+	+	+	+	o	o	-	-	-
Allylether acetate	100	+	+	+	+	+	+	+	-	o	-
Alum	100	+	+	+	+	+	+	+	-	o	-
Alumina	100	+	+	+	+	+	+	+	+	o	o
Aluminium acetate	100	+	+	+	+	+	+	+	+	o	o
Aluminium chloride	100	+	+	+	+	+	+	+	o	+	o
Aluminium fluoride	100	+	+	+	+	+	+	+	+	+	-
Aluminium hydroxide	100	+	+	+	+	+	+	+	+	o	o
Aluminium hydroxidacetate	100	+	+	+	+	+	+	+	+	o	o
Aluminium nitrate	100	+	+	+	+	+	+	+	+	o	o
Aluminium oxide	100	+	+	+	+	+	+	+	+	o	o
Aluminium sulfate	100	+	+	+	+	+	+	+	+	o	o
Amino acid	100	+	+	+	+	+	+	+	+	+	o
Aminoacetic acid	100	+	+	+	+	+	+	+	+	+	o
Aminobenzene	100	+	+	+	o	o	+	+	+	-	o
Amino methane	100	+	+	+	+	+	+	+	-	o	+
Ammonia	100	+	+	+	+	+	+	+	o	o	-
Ammonia solution	100	+	+	+	+	+	+	+	o	o	-
Ammonium acetate	100	+	+	+	+	+	+	+	+	+	+
Ammonium alum	100	+	+	+	+	+	+	+	+	o	-

Materials - Chemical Resistance

Substances

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA	Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA	
Ammon.aluminiumsulfate	100	+	+	+	+	+	+	+	+	o	-	Benzyl chloride	100	+	+	+	+	+	+	-	-	-	-	
Ammonium carbonate	100	+	+	+	+	+	+	+	+	+	-	Benzoic aldehyde	100	+	+	+	+	+	+	+	+	-	o	
Ammonium chloride	100	+	+	+	+	+	+	+	o	+	-	Benzoyl chloride	100	+	+	+	+	+	+	-	-	-	-	
Ammonium fluoride	100	+	+	+	+	+	+	+	o	+	-	Benzylsulfonic acid	100	+	+	+	+	+	+	o	-	-	-	
Ammonium hydroxide	25	+	+	+	+	+	+	+	o	o	-	Benzyl acetate	100	+	+	+	+	+	+	+	+	-	o	
Ammonium nitrate	100	+	+	+	+	+	+	+	o	o	o	Bisulfite SO ₂	100	+	+	+	+	+	+	+	o	o	o	
Ammonium oxalate	100	+	+	+	+	+	+	+	o	+	o	Bitumen	100	+	+	+	+	+	+	o	+	+	o	
Ammon. peroxodisulfate	100	+	+	+	+	+	+	+	-	+	-	Bone glue	100	+	+	+	+	+	+	+	+	o	o	
Ammonium persulfate	100	+	+	+	+	+	+	+	-	+	-	Borax	100	+	+	+	+	+	+	+	+	+	o	
Ammonium phosphate	100	+	+	+	+	+	+	+	-	+	o	Boric acid	100	+	+	+	+	+	+	+	o	+	o	
Ammonium sulfate	100	+	+	+	+	+	+	+	+	o	o	Bornanone-2	100	+	+	+	+	+	+	+	+	+	o	
Ammonium sulfide	100	+	+	+	+	+	+	+	+	o	-	Brake fluid	100	+	+	+	+	+	+	+	+	+	o	
Ammon nitrate	100	+	+	+	+	+	+	+	o	o	o	Brine	25	+	+	+	+	+	+	+	+	+	+	
Ammon salpeter	100	+	+	+	+	+	+	+	o	o	o	Bromine	100	+	+	+	+	+	+	-	-	-	-	
Ammon sulfate	100	+	+	+	+	+	+	+	+	o	o	Bromomethane	100	+	+	+	+	+	+	o	o	-	-	
Amyl acetate	100	+	+	+	+	+	+	+	+	-	+	Butadiene-1,3	100	+	+	+	+	+	+	-	o	-	-	
Amyl alcohol	100	+	+	+	+	+	+	+	o	+	o	Butane	100	+	+	+	+	+	+	+	+	o	o	
Aniline	100	+	+	+	o	o	+	+	+	-	o	Butane acid	100	+	+	+	+	+	+	-	o	-	o	
Anisole	100	+	+	+	+	+	+	o	+	-	-	Butane diacid	100	+	+	+	+	+	+	+	+	-	-	
Anone	100	+	+	+	+	+	+	o	+	-	-	Butanol	100	+	+	+	+	+	+	+	o	+	o	
Antichlor	100	+	+	+	+	+	+	+	o	+	+	Butyl acetate	100	+	+	+	+	+	+	o	+	-	-	
Antifreezing compound	100	+	+	+	+	+	+	+	+	o	o	Butyl alcohol	100	+	+	+	+	+	+	+	o	+	o	
Antimonous chloride	100	+	+	+	+	+	+	+	-	+	o	Butyl glycolate	100	+	+	+	+	+	+	+	+	+	+	
Antimony butter	100	+	+	+	+	+	+	+	-	+	o	Butyl ether	100	+	+	+	+	+	+	-	+	-	-	
Antimony trichloride	100	+	+	+	+	+	+	+	-	+	o	Butyl phenol	100	+	+	+	+	+	+	o	-	-	-	
Aqua Regia	100	+	+	+	+	+	o	-	-	-	-	Butyric acid	100	+	+	+	+	+	+	-	o	-	o	
Arsenic acid	100	+	+	+	+	+	+	+	o	+	-	C												
Arsenic (V)-oxide hydrate	100	+	+	+	+	+	+	+	o	+	-	Calcium acetate	100	+	+	+	+	+	+	+	+	o	o	
Asphalt	100	+	+	+	+	+	+	o	+	+	o	Calcium bicarbonate	100	+	+	+	+	+	+	+	+	+	+	+
Aviation gasoline	100	+	+	+	+	+	+	o	+	-	-	Calcium carbonate	100	+	+	+	+	+	+	+	+	+	+	+
Azotic acid	65	+	+	+	+	+	o	-	-	-	-	Calcium chloride	100	+	+	+	+	+	+	+	+	o	-	
B												Calcium hydrogen carbonate	100	+	+	+	+	+	+	+	+	+	+	+
Barium carbonate	100	+	+	+	+	+	+	+	+	+	+	Calcium hydroxide	100	+	+	+	+	+	+	+	+	o	-	
Barium chloride	100	+	+	+	+	+	+	+	+	+	+	Calcium hypochloride	100	+	+	+	+	+	+	+	-	o	-	
Barium cyanide	100	+	+	+	+	+	+	-	+	+	o	Calcium nitrate	100	+	+	+	+	+	+	+	+	+	+	-
Barium hydroxide	100	+	+	+	+	+	+	o	+	+	-	Calcium oxide	100	+	+	+	+	+	+	+	+	+	+	+
Barium sulfate	100	+	+	+	+	+	+	+	+	+	o	Calcium sulfate	100	+	+	+	+	+	+	+	-	-	-	
Barium sulfide	100	+	+	+	+	+	+	o	+	+	o	Calcium sulfide	100	+	+	+	+	+	+	+	-	-	-	
Baryta hydrate	100	+	+	+	+	+	+	o	+	+	-	Camphor	100	+	+	+	+	+	+	+	+	o	o	
Battery acid	20	+	+	+	+	+	+	+	-	+	+	Camphora	100	+	+	+	+	+	+	+	+	o	o	
Beer	100	+	+	+	+	+	+	+	+	+	+	Camphoric oil	100	+	+	+	+	+	+	+	+	+	o	o
Benzaldehyde	100	+	+	+	+	+	+	+	+	-	o	Carbamide	100	+	+	+	+	+	+	+	+	+	+	+
Benzoic acid	100	+	+	+	+	+	+	+	-	o	o	Carbolic acid	100	+	+	+	+	+	+	o	-	-	-	
Benzene	100	+	+	+	+	+	+	o	+	-	-	Carbon disulfide	100	+	+	+	+	+	+	-	+	-	-	
Benzene diol-1,3	50	+	+	+	+	+	+	+	-	o	o	Carbon tetrachloride	100	+	+	+	+	+	+	o	-	-	-	
Benzyl acetate	100	+	+	+	+	+	+	+	+	-	o	Carbonic acid	100	+	+	+	+	+	+	+	+	o	o	
Benzyl alcohol	100	+	+	+	+	+	+	-	-	-	-	Caustic baryta	100	+	+	+	+	+	+	o	+	+	-	

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Materials - Chemical Resistance

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Caustic potash	100	+	+	+	+	+	+	+	o	o	o
Caustic potash solution	100	+	+	+	+	+	+	+	o	o	o
Caustic soda	85	+	+	+	+	+	+	+	o	+	-
Cellulosolve®	100	+	+	+	+	+	+	+	-	-	-
Cetyl alcohol	100	+	+	+	+	+	+	+	+	+	+
Chalk	100	+	+	+	+	+	+	+	+	+	+
Chlorine	100	+	+	+	+	+	+	o	-	-	-
Chloral hydrate	100	+	+	+	+	+	+	o	-	-	-
Chloric acid	25	+	+	+	+	+	+	+	-	-	-
Chloroacetic acid	100	+	+	+	+	+	+	+	-	o	-
Chlorobenzene	100	+	+	+	+	+	+	o	+	-	-
Chloroethane	100	+	+	+	+	+	+	o	o	-	-
Chloroethanol-2	100	+	+	+	+	+	+	o	-	-	-
Chloroethyl	100	+	+	+	+	+	+	o	o	-	-
Chlorethylene	100	+	+	+	o	o	+	-	-	-	-
Chloroform	100	+	+	+	o	o	+	+	o	-	-
Chlorofluorocarbon (FFC)	100	+	+	+	+	+	+	+	-	o	o
Chloromethane	100	+	+	+	+	+	-	o	o	-	-
Chloropropene-3	100	+	+	+	+	+	o	o	-	-	-
Chlorosulfonic acid	100	+	+	+	+	+	+	-	-	-	-
Chlorotoluene	100	+	+	+	+	+	+	-	-	-	-
Chromium(VI) oxide	100	+	+	+	+	+	+	+	-	o	-
Chromic acid	50	+	+	+	+	+	+	o	-	-	-
Chromic anhydride	100	+	+	+	+	+	+	+	-	o	-
Chromic sulfuric acid	100	+	+	+	+	+	+	o	-	-	-
Chromium trioxide	100	+	+	+	+	+	+	+	-	o	-
Citric acid	10	+	+	+	+	+	+	+	-	+	o
Coal tar particles	100	+	+	+	+	+	+	o	+	+	o
Cod liver oil	100	+	+	+	+	+	+	+	+	+	+
Copper chloride	100	+	+	+	+	+	+	+	-	+	+
Copper(I) cyanide	50	+	+	+	+	+	+	+	+	+	o
Copper(II) nitrate	100	+	+	+	+	+	+	+	o	+	+
Copper(II) sulfate	100	+	+	+	+	+	+	+	+	o	o
Cresol	100	+	+	+	+	+	+	o	-	-	-
Cumene	100	+	+	+	+	+	+	o	+	-	-
Cyclohexane	100	+	+	+	+	+	+	o	+	-	-
Cyclohexanol	100	+	+	+	+	+	+	o	+	-	-
Cyclohexanone	100	+	+	+	+	+	+	o	+	-	-
D											
D-Glucose	100	+	+	+	+	+	+	+	+	+	+
Decahydronaphthalene	100	+	+	+	+	+	+	o	+	-	o
Decalin	100	+	+	+	+	+	+	o	+	-	o
Decane	100	+	+	+	+	+	+	o	+	o	-
Denatured alcohol	100	+	+	+	+	+	+	+	-	o	o
Desiccator grease	100	+	+	+	+	+	+	+	o	-	-
Dextrin	100	+	+	+	+	+	+	+	+	+	+
Dextrose	100	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Diacetone	100	+	+	+	+	+	-	+	-	o	o
Diacetone alcohol	100	+	+	+	+	+	-	+	-	o	o
Diaminoethane	100	+	+	+	+	+	+	+	-	-	-
Dibutyl ether	100	+	+	+	+	+	+	-	+	-	-
Dichloroacetic acid	100	+	+	+	+	+	+	+	-	o	-
Dichlorobenzene	100	+	+	+	+	+	+	o	+	-	-
Dichloroethane	100	+	+	+	+	+	+	-	+	-	-
Dichloromethane	100	+	+	+	o	o	-	o	o	-	-
Diesel fuel	100	+	+	+	+	+	+	+	+	-	o
Diethanolamine	100	+	+	+	+	+	-	+	+	o	o
Diethyl ether	100	+	+	+	+	+	+	-	+	-	-
Diethylamine	100	+	+	+	+	+	-	+	+	o	o
Diethyle ketone	100	+	+	+	o	o	-	o	+	-	-
Diethylene glycol	100	+	+	+	+	+	+	+	+	o	o
Diethylene oxide	100	+	+	+	+	+	-	o	+	-	-
Diglycol	100	+	+	+	+	+	+	+	+	o	o
Dihydroxybenzene	100	+	+	+	+	+	+	+	-	-	+
Dihydroxybenzene-1,3	50	+	+	+	+	+	+	+	-	o	o
Diisobutyl ketone	100	+	+	+	o	o	-	o	+	-	-
Dimethyl benzene	100	+	+	+	+	+	+	o	+	-	-
Dimethyl ether	100	+	+	+	+	+	+	-	+	-	-
Dimethyl formamide	100	+	+	+	o	o	-	+	o	-	-
Dimethyl sulfoxide	100	+	+	+	+	+	-	+	+	+	o
Dimethylamine	100	+	+	+	+	+	-	+	+	o	o
Dioxane	100	+	+	+	+	+	-	o	+	-	-
Diphenyl ether	100	+	+	+	+	+	+	-	+	-	-
Diphenyl oxide	100	+	+	+	+	+	+	-	+	-	-
Dipropylene glycol	100	+	+	+	+	+	+	+	+	+	+
Disodium tetraborate	100	+	+	+	+	+	+	+	+	+	o
Disulfide	100	+	+	+	+	+	+	-	+	-	-
DMSO	100	+	+	+	+	+	-	+	+	+	o
E											
Eau de Javelle	20	+	+	+	+	+	+	o	-	+	-
Ethanal	100	+	+	+	+	+	+	o	-	-	o
Ethane diacid	100	+	+	+	+	+	+	o	+	-	-
Ethane diamine-1,2	100	+	+	+	+	+	+	+	-	-	-
Ethane diol-1,2	100	+	+	+	+	+	+	+	+	+	+
Ethanol	100	+	+	+	+	+	+	+	-	o	o
Ether	100	+	+	+	+	+	+	-	+	-	-
Ethyl acetate	100	+	+	+	+	+	-	o	+	-	-
Ethyl acrylate	100	+	+	+	+	+	o	o	+	-	-
Ethyl alcohol	100	+	+	+	+	+	+	+	-	o	o
Ethyl benzene	100	+	+	+	o	o	o	o	+	-	-
Ethyl chloride	100	+	+	+	+	+	+	o	o	-	-
Ethyl ether	100	+	+	+	+	+	+	-	+	-	-
Ethylene chlorohydrine	100	+	+	+	+	+	+	o	-	-	-
Ethylene glycol	100	+	+	+	+	+	+	+	+	+	+

Materials - Chemical Resistance

Substances

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Ethylene glycol ethyl ether	100	+	+	+	+	+	+	+	-	-	-
Ethylene methyl ketone	100	+	+	+	+	+	+	+	+	-	-
Ethylene oxide	100	+	+	+	+	+	+	o	+	-	-
Ethylenediamine	100	+	+	+	+	+	+	+	-	-	-
F											
Fatty acids	100	+	+	+	+	+	+	+	+	+	+
Ferric chloride	100	+	+	+	+	+	+	+	+	+	o
Ferric nitrate	100	+	+	+	+	+	+	+	+	+	+
Ferric sulfate	100	+	+	+	+	+	+	+	+	+	o
Fertilizer	100	+	+	+	+	+	+	+	+	o	o
Fixing baths	100	+	+	+	+	+	o	+	+	-	-
Fluorhydric acid	45	+	+	+	+	+	+	+	-	-	-
Fluorine	100	+	+	+	+	+	+	o	-	-	-
Fluosilicic acid	100	+	+	+	+	+	+	+	-	o	o
Formaldehyde	40	+	+	+	+	+	+	+	o	-	-
Formic acid	100	+	+	+	+	+	+	+	-	+	o
Formic acid amide	100	+	+	+	+	+	+	+	o	-	-
Formalin	40	+	+	+	+	+	+	+	o	-	-
Formamide	100	+	+	+	+	+	+	+	o	-	-
Fruit juice	100	+	+	+	+	+	+	+	+	o	+
Fuel oil	100	+	+	+	+	+	+	+	+	+	+
Furfural	100	+	+	+	+	+	o	-	o	-	-
Furfural	100	+	+	+	+	+	o	-	o	-	-
Furfuryl aldehyde	100	+	+	+	+	+	o	-	o	-	-
G											
Gasoline, aromatic	100	+	+	+	+	+	+	o	+	-	-
Gasoline, leaded	100	+	+	+	+	+	+	o	+	-	-
Gasoline, test	100	+	+	+	+	+	+	o	+	-	-
Gasoline, unleaded	100	+	+	+	+	+	+	o	+	-	-
Gelatine	100	+	+	+	+	+	+	+	+	+	o
Glacial acetic acid	100	+	+	+	+	+	+	+	-	o	-
Glauber's salt	100	+	+	+	+	+	+	+	o	+	+
Glue	100	+	+	+	+	+	+	+	+	o	o
Glycerin	100	+	+	+	+	+	+	+	+	+	+
Glycine	10	+	+	+	+	+	+	+	+	+	o
Glycoll	10	+	+	+	+	+	+	+	+	+	o
Glycol	100	+	+	+	+	+	+	+	+	+	+
Glycolic acid	100	+	+	+	+	+	+	+	+	o	o
Grape sugar	100	+	+	+	+	+	+	+	+	+	+
Grease and oil	100	+	+	+	+	+	+	+	+	+	+
Gypsum	100	+	+	+	+	+	+	+	-	-	-
H											
Heptane	100	+	+	+	+	+	+	o	+	-	-
Hexadecanol	100	+	+	+	+	+	+	+	+	+	+
Hexafluorosilicic acid	100	+	+	+	+	+	+	+	-	o	o
Hexane	100	+	+	+	+	+	+	o	+	-	-
Hexane diacid	100	+	+	+	+	+	+	+	+	+	-

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Hexane triol-1,2,6	100	+	+	+	+	+	+	+	+	+	+
Hexanol	100	+	+	+	+	+	+	+	o	+	o
Hexyl alcohol	100	+	+	+	+	+	+	+	o	+	o
Hydrazine hydrate	100	+	+	+	o	o	-	-	-	-	o
Hydrobromic acid	100	+	+	+	+	+	+	+	-	-	-
Hydrochloric acid	37	+	+	+	+	+	+	+	-	o	o
Hydrocyanic acid	100	+	+	+	+	+	+	+	o	o	o
Hydrofluorocarbons	100	+	+	+	+	+	+	+	-	o	o
Hydrofluoric acid	45	+	+	+	+	+	+	+	-	-	-
Hydrogen peroxide	90	+	+	+	+	+	+	+	-	+	-
Hydrogen sulfide	100	+	+	+	+	+	+	-	+	-	-
Hydrogen sulfite	100	+	+	+	+	+	+	+	o	o	o
Hydroquinone	100	+	+	+	+	+	+	+	-	-	+
Hydrosulfide	100	+	+	+	+	+	+	-	+	-	-
Hydroxybenzoic acid	100	+	+	+	+	+	+	+	+	+	+
Hydroxyacetic acid	100	+	+	+	+	+	+	+	+	o	o
Hydroxypropionic acid-2	100	+	+	+	+	+	+	+	o	+	o
I											
Iodine	100	+	+	+	+	+	+	o	-	-	-
Iodine tincture	100	+	+	+	+	+	+	o	-	-	-
Isobutyl acetate	100	+	+	+	+	+	+	o	+	-	-
Isobutyl alcohol	100	+	+	+	+	+	+	+	-	o	o
Isooctane	100	+	+	+	+	+	+	+	+	-	o
Isopropanol	100	+	+	+	+	+	+	+	o	+	+
Isopropyl acetate	100	+	+	+	+	+	o	o	+	-	-
Isopropyl alcohol	100	+	+	+	+	+	+	+	o	+	+
Isopropyl benzene	100	+	+	+	+	+	+	o	+	-	-
Isopropyl ether	100	+	+	+	+	+	+	-	+	-	-
Isovaleron	100	+	+	+	o	o	-	o	+	-	-
J											
Javelle water	20	+	+	+	+	+	+	o	-	+	-
K											
Kerosene	100	+	+	+	o	o	+	o	+	-	-
Kerosine	100	+	+	+	o	o	+	o	+	-	-
L											
Lactic acid	100	+	+	+	+	+	+	+	o	+	o
Lanoline	100	+	+	+	+	+	+	+	+	+	+
Lead(II) acetate	100	+	+	+	+	+	+	+	+	o	o
Lead sugar	100	+	+	+	+	+	+	+	+	o	o
Lead tetraethyl	100	+	+	+	+	+	+	+	+	o	-
Lime	100	+	+	+	+	+	+	+	+	+	+
Linseed oil	100	+	+	+	+	+	+	+	+	+	+
Lubricating oil	100	+	+	+	+	+	+	+	+	+	+
M											
Machinery oil	100	+	+	+	+	+	+	+	+	+	o
Magnesium carbonate	100	+	+	+	+	+	+	o	+	+	+
Magnesium chloride	100	+	+	+	+	+	+	+	+	o	o

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Materials - Chemical Resistance

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Magnesium hydroxide	100	+	+	+	+	+	+	+	+	o	o
Magnesium nitrate	100	+	+	+	+	+	+	+	+	o	o
Magnesium sulfate	100	+	+	+	+	+	+	+	+	o	o
Maleic acid	100	+	+	+	+	+	+	+	o	o	o
Marble lime hydrate	100	+	+	+	+	+	+	+	+	o	-
MEK	100	+	+	+	+	+	+	+	+	-	-
Menthol	100	+	+	+	+	+	+	+	o	o	+
Mercury	100	+	+	+	+	+	+	o	+	o	+
Mercury(II)-chloride	100	+	+	+	+	+	+	+	+	+	+
Mercury(II)-cyanide	50	+	+	+	+	+	+	+	+	+	o
Mercury(II)-nitrate	100	+	+	+	+	+	+	+	o	+	+
Methacrylic ester	100	+	+	+	o	o	o	-	+	-	-
Methanal	40	+	+	+	+	+	+	+	o	-	-
Methanol	100	+	+	+	+	+	+	+	-	o	o
Methoxyethanol	100	+	+	+	+	+	+	+	+	+	+
Methoxybenzene	100	+	+	+	+	+	+	o	+	-	-
Methoxybutanol	100	+	+	+	o	o	o	o	+	-	-
Methyl acetate	100	+	+	+	+	+	-	o	+	-	-
Methyl alcohol	100	+	+	+	+	+	+	+	-	o	o
Methyl amine	100	+	+	+	+	+	+	+	-	o	+
Methyl benzene	100	+	+	+	+	+	+	o	+	-	-
Methyl bromide	100	+	+	+	+	+	+	o	o	-	-
Methyl butyl ketone	100	+	+	+	o	o	o	o	+	-	-
Methyl cellosolve	100	+	+	+	+	+	+	+	+	+	+
Methyl chloride	100	+	+	+	+	+	-	o	o	-	-
Methyl cyanide	100	+	+	+	+	+	o	+	+	-	-
Methyl ether	100	+	+	+	+	+	+	-	+	-	-
Methyl ethyl ether	100	+	+	+	+	+	+	-	+	-	-
Methyl ethyl ketone	100	+	+	+	+	+	+	+	+	-	-
Methyl ethyl ketone-2	100	+	+	+	+	+	+	+	+	-	-
Methyl glycol	100	+	+	+	+	+	+	+	+	+	+
Methyl isobutyl ketone	100	+	+	+	o	o	+	o	+	-	-
Methyl methacrylate	100	+	+	+	o	o	o	-	+	-	-
Methyl phenylketone	100	+	+	+	+	+	+	+	-	-	-
Methylenchlorid	100	+	+	+	o	o	-	o	o	-	-
Methyl pentanone	100	+	+	+	o	o	+	o	+	-	-
Milk	100	+	+	+	+	+	+	+	+	+	+
Mineral oil	100	+	+	+	+	+	+	+	+	+	+
Mineral oil, non-aromatic	100	+	+	+	+	+	+	+	+	+	o
Monochloroacetic acid	100	+	+	+	+	+	+	+	-	o	-
Montanic wax	100	+	+	+	+	+	+	o	+	+	o
N											
Naphta	100	+	+	+	o	o	+	o	+	-	-
Nickel chloride	100	+	+	+	+	+	+	+	o	+	+
Nickel sulfate	100	+	+	+	+	+	+	+	o	+	+
Nitrate of sodium	100	+	+	+	+	+	+	+	o	+	+
Nitril triethanol	100	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Nitrobenzene	100	+	+	+	+	+	+	-	o	-	-
Nitrogen monoxide	100	+	+	+	+	+	+	+	+	+	+
Nitromethane	100	+	+	+	+	+	+	o	o	-	-
Nitrous acid	50	+	+	+	+	+	+	+	-	o	o
Nitrous oxide	100	+	+	+	+	+	+	+	o	-	-
Nonyl alcohol	100	+	+	+	+	+	+	+	o	+	o
O											
Octadecan acid	100	+	+	+	+	+	+	+	+	+	+
Octane	100	+	+	+	+	+	+	+	+	-	o
Oil, essential	100	+	+	+	+	+	+	o	+	-	o
Oleic acid	100	+	+	+	+	+	+	o	+	-	-
Oleum	100	+	+	+	-	-	-	-	-	-	-
Oleum Jecoris	100	+	+	+	+	+	+	+	+	+	+
Oxalic acid	100	+	+	+	+	+	+	o	+	-	-
Oxalic acid diammonium salt	100	+	+	+	+	+	+	+	o	+	o
Oxidiethanol	100	+	+	+	+	+	+	+	+	o	o
Oxirane	100	+	+	+	+	+	+	o	+	-	-
Oxolane	100	+	+	+	o	o	o	o	+	-	-
Ozocerite	100	+	+	+	+	+	+	o	+	+	o
Ozone	100	+	+	+	+	+	+	+	+	o	o
P											
Palmitic acid	100	+	+	+	+	+	+	o	+	-	-
Paraffins	100	+	+	+	+	+	+	+	+	+	+
Pentanol	100	+	+	+	+	+	+	+	o	+	o
Pentanol-1	100	+	+	+	+	+	+	+	o	+	o
Pentanone-3	100	+	+	+	o	o	-	o	+	-	-
Pentyl acetate	100	+	+	+	+	+	+	+	+	-	+
Perchloric acid	100	o	o	o	o	o	+	o	-	o	-
Perchloroethylene	100	+	+	+	-	-	+	-	+	-	-
Perfume	100	+	+	+	+	+	+	o	+	-	o
Peroxide of hydrogen	90	+	+	+	+	+	+	+	-	+	-
Petroleum	100	+	+	+	o	o	+	o	+	-	-
Petroleum ether	100	+	+	+	+	+	+	-	+	-	-
Phenol	100	+	+	+	+	+	+	o	-	-	-
Phenyl ether	100	+	+	+	+	+	+	-	+	-	-
Phenylamine	100	+	+	+	o	o	+	+	+	-	o
Phenylethanone-1	100	+	+	+	+	+	+	+	-	-	-
Phenylmethanol	100	+	+	+	+	+	+	-	-	-	-
Phosphoric acid	85	+	+	+	+	+	+	+	-	o	-
Phosphorus chloride	100	+	+	+	+	+	+	o	o	-	-
Phosphorus trichloride	100	+	+	+	+	+	+	o	o	-	-
Phthalate	100	+	+	+	+	+	+	+	+	-	o
Phthalate ester	100	+	+	+	+	+	+	+	+	-	o
Pikric acid	100	+	+	+	o	o	+	+	-	o	-
Potash	100	+	+	+	+	+	+	+	o	o	+
Potassium acetate	100	+	+	+	+	+	+	+	o	o	o
Potass. aluminium sulfate	100	+	+	+	+	+	+	+	-	o	-

Materials - Chemical Resistance

Substances

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA	Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Potassium bicarbonate	100	+	+	+	+	+	+	+	+	+	+	Soda ash	100	+	+	+	+	+	+	+	○	○	+
Potassium bichromate	100	+	+	+	+	+	+	+	○	○	○	Soda lye	85	+	+	+	+	+	+	+	○	+	-
Potassium bromide	100	+	+	+	+	+	+	+	○	○	+	Sodium acetate	100	+	+	+	+	+	+	+	○	○	○
Potassium carbonate	100	+	+	+	+	+	+	+	○	○	+	Sodium benzoate	100	+	+	+	+	+	+	+	○	○	○
Potassium chlorate	100	+	+	+	+	+	+	+	+	+	+	Sodium bicarbonate	100	+	+	+	+	+	+	+	+	+	+
Potassium chloride	100	+	+	+	+	+	+	+	+	+	+	Sodium bisulfate	100	+	+	+	+	+	+	+	+	+	○
Potassium chromate	100	+	+	+	+	+	+	+	○	+	+	Sodium bisulfite	100	+	+	+	+	+	+	+	○	+	-
Potassium cyanide	50	+	+	+	+	+	+	+	+	+	○	Sodium bromide	100	+	+	+	+	+	+	+	○	○	+
Potassium dichromate	100	+	+	+	+	+	+	+	○	○	○	Sodium carbonate	100	+	+	+	+	+	+	+	○	○	+
Potassium ferrocyanide	100	+	+	+	+	+	+	+	○	+	○	Sodium chromate	100	+	+	+	+	+	+	+	○	+	○
Potassium ferricyanide	100	+	+	+	+	+	+	+	○	+	○	Sodium chlorate	100	+	+	+	+	+	+	+	-	+	+
Pota. hexacyanoferrate(II)	100	+	+	+	+	+	+	+	○	+	○	Sodium chloride	100	+	+	+	+	+	+	+	+	+	+
Pota. hexacyanoferrate(III)	100	+	+	+	+	+	+	+	○	+	○	Sodium chlorite	100	+	+	+	+	+	+	+	-	+	+
Potassium hydroxide	100	+	+	+	+	+	+	+	○	○	○	Sodium cyanide	50	+	+	+	+	+	+	+	+	+	○
Potassium hypochlorite	20	+	+	+	+	+	+	○	-	+	-	Sodium dithionite	100	+	+	+	+	+	+	+	○	+	+
Potassium iodide	100	+	+	+	+	+	+	+	+	○	+	Sodium fluoride	100	+	+	+	○	○	+	+	○	+	+
Potassium nitrate	100	+	+	+	+	+	+	+	○	+	+	Sodiu. hydrogen carbonate	100	+	+	+	+	+	+	+	+	+	+
Potassium perchlorate	25	+	+	+	+	+	+	+	+	+	+	Sodiu. hydrogen sulfate	100	+	+	+	+	+	+	+	+	+	○
Potassium permanganate	100	+	+	+	+	+	+	+	-	○	+	Sodiu. hydrogen sulfite	100	+	+	+	+	+	+	+	○	+	-
Potassium persulfate	100	+	+	+	+	+	+	+	+	○	○	Sodium hydroxide	85	+	+	+	+	+	+	+	○	+	-
Propane	100	+	+	+	+	+	+	-	○	-	-	Sodium hyposulfite	100	+	+	+	+	+	+	+	○	+	+
Propanediol-1,2	100	+	+	+	+	+	+	+	+	+	+	Sodium nitrate	100	+	+	+	+	+	+	+	○	+	+
Propanoic acid	100	+	+	+	+	+	+	+	-	○	○	Sodium nitrite	100	+	+	+	+	+	+	+	○	+	+
Propanol	100	+	+	+	+	+	+	+	○	+	+	Sodiu. perborate Tetrahydrate	100	+	+	+	+	+	+	+	○	+	-
Propan-2-ol	100	+	+	+	+	+	+	+	○	+	+	Sodium perchlorate	25	+	+	+	+	+	+	+	+	+	+
Propantriol	100	+	+	+	+	+	+	+	+	+	+	Sodium peroxide	100	+	+	+	+	+	+	○	+	+	○
Propen-2-ol-1	100	+	+	+	+	+	+	+	-	○	-	Sodium peroxodisulfate	100	+	+	+	+	+	+	+	○	+	+
Propyl alcohol	100	+	+	+	+	+	+	+	○	+	+	Sodium persulfate	100	+	+	+	+	+	+	+	○	+	+
Propylene glycol	100	+	+	+	+	+	+	+	+	+	+	Sodium phosphate	100	+	+	+	+	+	+	+	○	+	+
Propylene oxide	100	+	+	+	○	○	○	+	+	-	○	Sodium silicate	100	+	+	+	+	+	+	+	○	+	+
Prussiate of potash , red	100	+	+	+	+	+	+	+	○	+	○	Sodium sulfate Decahydrate	100	+	+	+	+	+	+	+	○	+	+
Prussiate of potash , yell.	100	+	+	+	+	+	+	+	○	+	○	Sodium sulfide	100	+	+	+	+	+	+	+	○	+	+
Pyridine	100	+	+	+	○	○	-	+	-	-	-	Sodium sulfite	100	+	+	+	+	+	+	+	○	+	+
Q												Sodium superoxide	100	+	+	+	+	+	+	○	+	+	○
Quinol	100	+	+	+	+	+	+	+	-	-	+	Sodiu. tetraborate Decahydra.	100	+	+	+	+	+	+	+	+	+	○
R												Sodium thiosulfate	100	+	+	+	+	+	+	+	○	+	+
Resorcinol	50	+	+	+	+	+	+	+	-	○	○	Soft soap	25	+	+	+	+	+	+	+	○	+	+
S												Stearic acid	100	+	+	+	+	+	+	+	+	+	+
Salicylic acid	100	+	+	+	+	+	+	+	+	+	+	Styrene	100	+	+	+	+	+	+	○	+	-	-
Salmiac	100	+	+	+	+	+	+	+	○	○	-	Styrolene	100	+	+	+	+	+	+	○	+	-	-
Salt, red	100	+	+	+	+	+	+	+	○	○	○	Sublimate	100	+	+	+	+	+	+	+	+	+	+
Selenite	100	+	+	+	+	+	+	+	-	-	-	Succinic acid	100	+	+	+	+	+	+	+	+	-	-
Silicic acid	100	+	+	+	+	+	+	+	+	○	○	Sulfuric acid	98	+	+	+	+	+	+	○	-	-	-
Silicone oils	100	+	+	+	+	+	+	+	+	+	+	Sulfuric acid fuming	100	+	+	+	-	-	-	-	-	-	-
Silver acetate	100	+	+	+	+	+	+	+	○	○	○	Sulfur dioxide	100	+	+	+	+	+	+	+	-	○	○
Silver cyanide	50	+	+	+	+	+	+	+	+	+	○	T											
Silver nitrate	100	+	+	+	+	+	+	+	○	+	+	Table salt	100	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Materials - Chemical Resistance

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Tallow	100	+	+	+	+	+	+	+	+	+	+
Tannic acid	100	+	+	+	+	+	+	+	+	o	-
Tannins	100	+	+	+	+	+	+	+	+	o	-
Tartaric acid	100	+	+	+	+	+	+	+	+	o	o
Tensides, non alkaline	5	+	+	+	+	+	+	+	+	+	+
Tetrachloroethane	100	+	+	+	-	-	+	-	+	-	-
Tetrachloroethylene	100	+	+	+	-	-	+	-	+	-	-
Tetrachloromethane	100	+	+	+	+	+	+	o	-	-	-
Tetraethyl lead	100	+	+	+	+	+	+	+	+	o	-
Tetrahydrofuran	100	+	+	+	o	o	o	o	+	-	-
Tetrahydronaphthalene	100	+	+	+	+	+	+	o	+	-	o
Tetralin	100	+	+	+	+	+	+	o	+	-	o
Tetramethylene oxide	100	+	+	+	o	o	o	o	+	-	-
THF	100	+	+	+	o	o	o	o	+	-	-
Thionyl chloride	100	+	+	+	+	+	o	-	-	-	-
Thinner (Solvol)	100	+	+	+	+	+	+	+	o	-	-
Toluol	100	+	+	+	+	+	+	o	+	-	-
Transformer oil	100	+	+	+	+	+	+	+	+	+	+
Trichlorobenzene	100	+	+	+	+	+	+	-	o	-	-
Trichloroacetic acid	100	+	+	+	+	+	+	o	-	o	o
Trichloroethylene	100	+	+	+	+	+	+	-	+	-	-
Trichloromethane	100	+	+	+	o	o	+	+	o	-	-
Triethanolamine	100	+	+	+	+	+	+	+	+	+	+
Triethylene glycol	100	+	+	+	+	+	+	+	+	+	+
Trifluorotrichloroethane	100	+	+	+	+	+	+	-	o	-	-
Triglycerides	100	+	+	+	+	+	+	+	+	+	+
Triglycol	100	+	+	+	+	+	+	+	+	+	+
Trimethylpentane-2,2,4	100	+	+	+	+	+	+	+	+	-	o
Trinitrophenol-2,4,6	100	+	+	+	o	o	+	+	-	o	-
Turpentine	100	+	+	+	+	+	+	o	+	-	-
Turpentine substitute	100	+	+	+	+	+	+	o	+	-	o
U											
Urea	100	+	+	+	+	+	+	+	+	+	+
Uric acid	100	+	+	+	+	+	+	+	+	+	o
Urine	100	+	+	+	+	+	+	+	+	+	+
V											
Vaseline	100	+	+	+	+	+	+	+	+	+	+
Vinyl acetate	100	+	+	+	o	o	+	-	-	-	-
Vinegar	100	+	+	+	+	+	+	+	o	+	-
Vinyl acetate	100	+	+	+	o	o	+	-	-	-	-
Vinyl chloride	100	+	+	+	o	o	+	-	-	-	-
Vinylbenzene	100	+	+	+	+	+	+	o	+	-	-
Vinyl cyanide	100	+	+	+	+	+	o	o	+	-	-
Vinylidene chloride	100	+	+	+	o	o	+	-	-	-	-
W											
Washing agents	5	+	+	+	+	+	+	+	+	+	+
Washing-up liquid	5	+	+	+	+	+	+	+	+	+	+

Definitions and abbreviations:

- + **Excellent chemical resistance** – continuous exposure for more than 30 days does not cause any damage or only minor damages.
- o **Limited chemical resistance** – depending on the plastic material, a continuous exposure for a longer period of time may cause damages such as cracks, decrease of mechanical strength, discoloration, etc.
- **Poor resistance** – the plastic material can be deformed or destroyed.

Substance at +20 °C	Conc. in %	PTFE	PFA	FEP	ETFE	ECTFE	PVDF	PP	PA	PS	PMMA
Water	100	+	+	+	+	+	+	+	+	+	+
Water demineralized	100	+	+	+	+	+	+	+	+	+	+
Water glass	100	+	+	+	+	+	+	+	+	+	+
Wine spirit	100	+	+	+	+	+	+	+	-	o	o
Woll fat	100	+	+	+	+	+	+	+	+	+	+
Woll wax	100	+	+	+	+	+	+	+	+	+	+
X											
Xylol	100	+	+	+	+	+	+	o	+	-	-
Y											
Yeasts	100	+	+	+	+	+	+	+	+	+	+
Z											
Zinc carbonate	100	+	+	+	+	+	+	+	o	o	+
Zinc chloride	100	+	+	+	+	+	+	+	+	+	+
Zinc nitrate	100	+	+	+	+	+	+	+	o	+	+