Chemical Resistance and Physical Properties of Plastics

Resin Codes

ECTFE: Ethylene- chlorotrifluoroethylene copolymer
ETFE: Ethylenetetrafluoroethylene
FEP: Fluorinated ethylene propylene
FLPE: Fluorinated high-density polyethylene
FLPP: Fluorinated polypropylene
HDPE: High-density polyethylene
LDPE: Low-density polyethylene
NYL: Nylon (polyamide)
PPCO: Polypropylene copolymer
PC: Polycarbonate
PETG: Polyethylene terephthalate copolyester
PK: Polyketone
PFA: Perfluoroalkoxy
PMMA: Polymethyl methacrylate
PMP: Polymethylpentene
PP: Polypropylene
PS: Polystyrene
PSF: Polysulfone
PTFE: Polytetrafluoroethylene
PUR: Polyurethane
PVC: Polyvinyl chloride
PVDF: Polyvinylidene fluoride
TPE: Thermoplastic elastomer
XLPE: Cross-linked high-density polyethylene

Do not store strong oxidizing agents in plastic labware except if made of FEP, PFA, or PTFE. Other plastics will become brittle after prolonged exposure.

Do not place plastic labware directly in a flame or on a hotplate unless specified.

Use these charts as general guides only. They are recommendations, not guarantees, of fitness for particular uses. Test materials under actual conditions first before using them for your applications.

Chemical Resistance Summary

Classes of substances; temperature 68°F (20°C)	ECTFE/ETFE	FEP/PTFE/PFA	FLPE	HDPE/XLPE	LDPE	NYL	PC	PETG	PK	PMMA	PMP	PP/PPCO	PS	PSF	PUR	PVC	PVDF	TPE†
Acids, weak or dilute	E	E	E	E	E	F	E	E	E	G	E	E	E	E	G	E	E	E
Acids*, strong or concentrated	G	E	E	E	E	N	N	N	G	N	E	E	F	G	F	E	E	F
Alcohols, aliphatic	E	E	E	E	E	N	G	E	G	N	E	E	E	G	F	E	E	E
Aldehydes	E	E	G	G	G	F	F	N	E	G	G	G	N	F	G	N	E	N
Bases	E	E	F	E	E	F	N	N	G	F	E	E	E	E	N	E	E	E
Esters	E	E	E	G	G	E	N	N	E	N	G	G	N	N	N	N	G	N
Hydrocarbons, aliphatic	E	E	E	G	F	E	F	E	E	G	F	G	N	G	E	E	E	N
Hydrocarbons, aromatic	E	E	E	G	F	E	N	N	E	N	F	F	N	N	N	N	E	N
Hydrocarbons, halogenated	E	E	G	F	N	G	N	N	E	N	N	F	N	N	N	N	N	N
Ketones	G	E	E	G	G	E	N	N	E	N	F	G	N	N	N	N	N	N
Oxidizing agents, strong	F	E	F	F	F	N	N	N	G	N	F	F	N	G	N	G	G	N

E—No damage after 30 days of constant exposure.

G—Little or no damage after 30 days of constant exposure.

F—Some effect after seven days of constant exposure. Depending on the plastic, the effect may be cracking, crazing, loss of strength, or discoloration. Solvents may cause softening, swelling, and permeation losses with PPCO, PP, PMP, LDPE, and HDPE; the solvent effects on these materials are normally reversible.

N—Not recommended for continuous use. Immediate damage may occur. Depending on the plastic, the effect will be severe cracking, crazing, loss of strength, discoloration, deformation, dissolution, or permeation loss.

** For oxidizing acids, see table entry "Oxidizing agents, strong."* *† TPE gaskets*

Physical Properties

Resin	Max use temp (°F/°C)	Brittleness temp (°F/°C)	Transparency	Sterilization					Specific gravity (g/mL)	Flexibility	Permeability (approximate) cc-mm / m² - 24hr - Bar			Water absorption (%)
				Autoclave	Gas	Dry heat	Radiation‡	Disinfectants			N_2	O_2	CO_2	
ECTFE, ETFE	302/150	–157/–105	Translucent	Yes	Yes	Yes	No	Yes	1.70	Rigid	—	—	—	<0.03
FEP	401/205	–454/–270	Translucent	Yes	Yes	Yes	No	Yes	2.15	Excellent	4960	11,625	34,100	<0.01
HDPE	248/120	–148/–100	Translucent	No	Yes	No	Yes	Yes	0.95	Rigid	651	2868	8990	<0.01
LDPE	176/80	–148/–100	Translucent	No	Yes	No	Yes	Yes	0.92	Excellent	2790	7750	41,850	<0.01
NYL	194/90	32/0	Translucent	No	Yes	No	Yes	Yes	1.13	Rigid	—	—	—	1.30
PPCO	250/121	–40/–40	Translucent	Yes	Yes	No	No	Yes	0.90	Moderate	698	3100	10,075	<0.02
PC	275/135	–211/–135	Transparent	Yes**	Yes	No	Yes	Yes	1.20	Rigid	775	4650	16,663	0.35
PETG	158/70	<–40/<–40	Transparent	No	Yes	No	Yes	Yes	1.27	Moderate	155	388	1240	0.15
PFA	482/250	–454/–270	Translucent	Yes	Yes	Yes	No	Yes	2.15	Excellent	4511	13,656	35,030	<0.03
PK	220	–40	Opaque	Yes	Yes	—	Yes	Some	1.24	Rigid	—	3.1	25	0.45
PMMA	122/50	—	Transparent	No	Yes	No	Yes	Some	1.20	Rigid	—	—	310	0.35
PMP	347/175	68/20	Transparent	Yes	Yes	Yes**	No	Yes	0.83	Rigid	17,050	69,750	—	0.01
PP	275/135	32/0	Translucent	Yes	Yes	No	No	Yes	0.90	Rigid	744	3720	12,400	<0.02
PS	194/90	68/20	Transparent	No	Yes	No	Yes	Some	1.05	Rigid	853	4650	17,825	0.05
PSF	329/165	–148/–100	Transparent	Yes	Yes	Yes**	Yes	Yes	1.24	Rigid	853	4650	10,850	0.30
PTFE	500/260	–450/–267	Translucent	Yes	Yes	Yes	Yes	Yes	2.15	Rigid	—	—	—	0.01
PUR	180/82	–94/–70	Transparent	Yes**††	Yes	No	Yes	Yes	1.20	Excellent	—	1162-5068	6975-25,575	0.03
PVC	158/70	–22/–30	Transparent	No**‡‡	Yes	No	No	Yes	1.34	Rigid	31-310	62	62	0.15-0.75
PVDF	230/110	–80/–62	Translucent	No	Yes	No	No	Yes	1.75	Rigid	140	217	7,828	0.05
TPE	250/121	—	Opaque	Yes	Yes	No	—	Some	1.20	Excellent	481-2248	1317-10,013	13,950-133,827	<0.01
XLPE	212/100	–180/–118	Translucent	No	Yes	No	Yes	Yes	0.93	Rigid	—	—	—	<0.01

‡ Radiation—gamma irradiation at 2.5 mrad with unstabilized plastic.
*** Sterilizing reduces mechanical strength. Do not use PC vessels for vacuum applications if they have been autoclaved.*
†† PUR tubing is not autoclavable.
‡‡ Some PVC tubing may be autoclaved; see specific product information.
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