

Chemical Resistance Reference Chart

This chart provides a guideline for the chemical resistance of the glass and plastic materials used in National Scientific labware. Because so many factors can affect chemical resistance, test your product under your actual conditions of use. For the chemical compatibility of Target HPLC Syringe Filters, see the chart on pp. 86-88.

Effects of Chemicals on Plastics. Chemicals can affect the strength, flexibility, surface appearance, color, dimensions, and weight of a plastic. These changes are caused by: (1) an attack on the polymer chain resulting in oxidation, reaction of functional groups, and depolymerization; (2) dissolution in a solvent and solvent absorption or permeation that causes softening and swelling; and (3) stress cracking from a “stress-cracking agent.”

Environmental stress cracking is the failure of a plastic in the presence of certain types of chemicals, but it is not a result of a chemical attack. Simultaneous presence of three factors causes stress cracking: tensile stress in the plastic, its inherent stress-cracking susceptibility, and a stress-cracking agent. Common stress-cracking agents are detergents, surface active chemicals, lubricants, oils, ultrapure water, and plating additives such as brighteners and wetting agents. Relatively small concentrations of stress-cracking agent may be sufficient to cause cracking.

Mixing and/or diluting certain chemicals in plastic labware can be potentially dangerous. The combining of different chemicals or two or more compounds of classes may produce a synergistic or undesirable chemical effect, resulting in an increased temperature that can affect chemical resistance (as temperature increases, resistance to attack decreases), causing product failure. Other factors that also affect chemical resistance include pressure, internal or external stresses (e.g., centrifugation), length of exposure, and concentration of the chemical. Always pre-test your specific usage and follow correct lab safety procedures.

Attention: Please be aware that, although several polymers may have excellent resistance to various flammable organic chemicals and solvents, OSHA H CFR 29 1910.106 for flammable and combustible materials or other local regulations may restrict the volume of solvents that may legally be stored in an enclosed area.

Effects of Chemicals on Glass. Clear borosilicate and amber 51 expansion glass exhibit a high degree of chemical resistance with a few exceptions: Some chemicals can etch the surface of glass. Surface etching does not usually affect the dimensional characteristics of glass, but it can release chemical components into the sample solution.

Key to Chart on Following Pages

- 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
- N** – Immediate damage may occur. Not recommended for continuous use
- S** – Surface etching possible

First letter of each pair applies to minimum temperature conditions; the second to maximum temperature conditions.

PLASTIC RESIN CODE	DESCRIPTION	APPEARANCE	TEMP MAX °C	TEMP MIN °C	AUTOCLAVABLE	DRY HEAT	GAMMA	MICROWAVABLE	ETHYLENE OXIDE
HDPE	High-density polyethylene	Opaque	120	-35	No	No	Yes	Yes	Yes
LDPE	Low-density polyethylene	Translucent	100	-40	No	No	Yes	Yes	Yes
TPX	Polymethylpentene	Transparent	175	0	Yes	No	Yes	Yes	Yes
PP	Polypropylene	Translucent	135	-20	Yes	No	No	Yes	Yes

CHEMICAL	LDPE	HDPE	PP	TPX	GLASS	CHEMICAL	LDPE	HDPE	PP	TPX	GLASS
1,4-Dioxane	GF	GG	FN	GF	EE	Cinnamon Oil	NN	NN	NN	NN	EE
2,2,4-Trimethylpentane	FN	FN	FN	FN	EE	Citric Acid, 10%	EE	EE	EE	EE	EE
2-Methoxyethanol	EG	EE	GE	EE	EE	Copper Sulfate	EE	EE	EE	EE	EE
2-Propanol	EE	EE	EE	EE	EE	Cresol	NN	FN	GF	NN	EE
Acetaldehyde	GN	GF	GN	GN	EE	Cyclohexane	FN	FN	GN	NN	EE
Acetamide, Sat.	EE	EE	EE	EE	EE	Cyclohexanone	NN	FN	FN	GF	EE
Acetic Acid, 5%	EE	EE	EE	EE	EE	Cyclopentane	NN	FN	FN	FN	EE
Acetic Acid, 50%	GF	EG	EE	EE	EE	Decahydronaphthalene	GF	EG	NN	FN	EE
Acetic Acid, Glacial	GN	GG	EG	GG	EE	Decalin	GF	EG	NN	FN	EE
Acetic Anhydride	NN	FF	GF	EG	EE	Diacetone	NN	NN	GF	FF	EE
Acetone	NN	NN	GN	EE	EE	Diacetone Alcohol	FN	EE	GF	EE	EE
Acetonitrile	EE	EE	EG	FN	EE	Dibutylphthalate	FN	FN	GN	GG	EE
Acetophenone	NN	FF	FN	GN	EE	Diethyl Benzene	NN	FN	NN	NN	EE
Acrylonitrile	EE	EE	EG	FN	EE	Diethyl Ether	NN	FN	FN	NN	EE
Adipic Acid	EG	EE	EE	EE	EE	Diethyl Ketone	NN	NN	GG	GF	EE
Alanine	EE	EE	EE	EE	EE	Diethyl Malonate	EE	EE	EE	EG	EE
Allyl Alcohol	EE	EE	EE	EG	EE	Diethylamine	NN	FN	GN	FF	EE
Aluminum Chloride	EE	EE	EE	EE	EE	Diethylene Dioxide	GF	GG	NN	FN	EE
Aluminum Hydroxide	EG	EE	EG	EG	SS	Diethylene Glycol	EE	EE	EE	EE	EE
Aluminum Salts	EE	EE	EE	EE	EE	Diethylene Glycol Ethyl Ether	EE	EE	EE	EE	EE
Amino Acids	EE	EE	EE	EE	EE	Dimethyl Acetamide	FN	EE	EE	FG	EE
Ammonia (pure)	EE	EE	EE	EE	SS	Dimethyl Formamide	EE	EE	EE	EE	EE
Ammonia, 25%	EE	EE	EE	EE	SS	Dimethylsulfoxide	EE	EE	EE	EE	EE
Ammonium Acetate, Sat.	EE	EE	EE	EE	EE	Dioxane	GF	GG	NN	FN	EE
Ammonium Chloride	EE	EE	EE	EE	EE	Dipropylene Glycol	EE	EE	EE	EE	EE
Ammonium Glycolate	EG	EE	EG	EG	EE	DMSO	EE	EE	EE	EE	EE
Ammonium Hydroxide, 5%	EE	EE	EE	EE	SS	Ethanol, 40%	EG	EE	EE	EG	EE
Ammonium Hydroxide, 30%	EG	EE	EG	EG	SS	Ether	NN	FN	NN	FN	EE
Ammonium Oxalate	EG	EE	EG	EG	EE	Ethyl Acetate	EE	EE	GN	FN	EE
Ammonium Salts	EE	EE	EE	EE	EE	Ethyl Alcohol (Absolute)	EG	EE	EE	EG	EE
Amyl Alcohol	EE	EE	EF	GF	EE	Ethyl Alcohol, 40%	EG	EE	EE	EG	EE
Amyl Chloride	NN	FN	NN	FF	EE	Ethyl Alcohol, 96%	EG	EG	EE	EG	EE
Aniline	EG	GF	EG	GF	EE	Ethyl Benzene	NN	FN	NN	NN	EE
Aqua Regia	NN	NN	NN	NN	SS	Ethyl Benzoate	FF	GG	GF	GF	EE
Arsenic Acid	GF	EE	EE	EE	EE	Ethyl Butyrate	GN	GF	GN	FN	EE
Benzaldehyde	EG	GN	EG	EF	EE	Ethyl Chloride	FN	NN	FN	FN	EE
Benzenamine	EG	GF	EG	GF	EE	Ethyl Chloride, Liquid	FN	FF	FN	FN	EE
Benzene	NN	NN	NN	NN	EE	Ethyl Cyanoacetate	EE	EE	EE	EE	EE
Benzoic Acid, Sat.	EE	EE	EG	EE	EE	Ethyl Lactate	EE	EE	EE	EE	EE
Benzyl Acetate	EG	EE	EG	EG	EE	Ethylene Chloride	NN	NN	NN	NN	EE
Benzyl Alcohol	NN	FN	GG	GG	EE	Ethylene Glycol	EE	EE	EE	EE	EE
Boric Acid	EE	EE	EE	EE	EE	Ethylene Glycol Monomethyl Ether	EG	EE	GF	EE	EE
Bromine	NN	FN	NN	NN	EE	Ethylene Oxide	FF	GF	FN	FN	EE
Bromobenzene	NN	NN	NN	NN	EE	Ethylene Oxide Gas	GG	GG	GG	GG	EE
Bromoform	NN	NN	NN	NN	EE	Ethylene Oxide, 100%	FF	GF	FN	FN	EE
Butadiene	NN	FN	NN	NN	EE	EtO Gas	GG	EE	EE	GG	EE
Butyl Acetate	GF	GF	FN	FF	EE	EtO	GF	GF	FN	FN	EE
Butyl Chloride	NN	NN	NN	FN	EE	Fatty Acids	EG	EE	EG	EG	EE
Butyric Acid	NN	FN	NN	NN	EE	Fluorides	EE	EE	EE	EE	EE
Calcium Chloride	EE	EE	EE	EE	EE	Fluorine	FN	GN	NN	FN	EE
Calcium Hydroxide, Conc.	EE	EE	EE	EE	SS	Formaldehyde, 10%	EE	EE	EE	EE	EE
Calcium Hypochlorite, Sat.	EE	EE	EE	EG	EE	Formaldehyde, 40%	EG	EG	EE	EE	EE
Carbazole	EE	EE	EE	EE	EE	Formalin, 10%	EE	EE	EE	EE	EE
Carbon Disulfide	NN	NN	NN	NN	EE	Formalin, 40%	EG	EG	EE	EE	EE
Carbon Tetrachloride	FN	GF	GF	NN	EE	Formic Acid	GG	EE	EG	EE	EE
Caustic Potash	EE	EE	EE	EE	SS	Formic Acid, 3%	EG	EE	EE	EE	EE
Caustic Soda, 1%	EE	FF	EE	EE	SS	Formic Acid, 100%	GG	EE	EG	EE	EE
Caustic Soda	GG	GF	EE	EE	SS	Formic Acid, 50%	GG	EE	EG	EE	EE
Cedarwood Oil	NN	FN	NN	NN	EE	Formic Acid, 85%	GG	EE	EG	EE	EE
Cellosolve Acetate	EG	EE	FN	EG	EE	Freon TF	EG	EG	EG	FN	EE
Chlorine Water	GN	GF	FN	NN	EE	Fuel Oil	FN	GF	EF	GF	EE
Chlorine, 10% (Moist)	GN	GF	FN	NN	EE	Gasoline	NN	FN	FN	GF	EE
Chlorine, 10% in air	GN	EF	FN	GN	EE	Glutaraldehyde	EG	EE	EE	FF	EE
Chlorine, wet gas	GN	GF	FN	NN	EE	Glutaraldehyde Disinfectant	EG	EE	EE	FF	EE
Chloroacetic Acid	EE	EE	EG	EG	EE	Glycerine	EE	EE	EE	EE	EE
Chlorobenzene	NN	NN	NN	NN	EE	Glycerol	EE	EE	EE	EE	EE
Chloroform	FN	FN	NN	NN	EE	Hexane	NN	GF	GF	FN	EE
Chromic Acid, 10%	EE	EE	EE	EE	EE	Hydrazine	NN	NN	NN	NN	EE
Chromic Acid, 20%	EE	EE	GG	EE	EE	Hydrobromic Acid, 69%	EE	EG	EG	EE	EE
Chromic Acid, 50%	EE	EE	GF	GG	EE	Hydrochloric Acid, 5%	EE	EE	EE	EE	EE
Chromic:Sulfuric	NN	NN	NN	NN	EE	Hydrochloric Acid, 20%	EE	EE	EE	EE	EE

Technical Information

CHEMICAL	LDPE	HDPE	PP	TPX	GLASS	CHEMICAL	LDPE	HDPE	PP	TPX	GLASS
Hydrochloric Acid, 35%	EE	EE	EG	EG	EE	Phenol, Liquid	NN	NN	NN	NN	EE
Hydrofluoric Acid, 4%	EE	EE	EE	EE	SS	Phosphoric Acid, 5%	EE	EE	EE	EE	EE
Hydrofluoric Acid, 48%	EE	EE	EG	EG	SS	Phosphoric Acid, 85%	EN	EE	EG	EG	EE
Hydrogen Peroxide, 3%	EE	EE	EG	EE	EE	Picric Acid	NN	NN	NN	EE	EE
Hydrogen Peroxide, 30%	EG	EE	EF	EG	EE	Pine Oil	GN	FN	EG	GF	EE
Hydrogen Peroxide, 90%	EN	EE	EF	EG	EE	Potassium Chloride	EE	EE	EE	EE	EE
Iodine Crystals	NN	NN	EE	GN	EE	Potassium Hydroxide, 01%	EE	FF	EE	EE	SS
Iso-Propanol, 100%	EE	EE	EE	EG	EE	Potassium Hydroxide, 30%	EE	EE	EE	EE	SS
Isobutanol	EE	EE	EE	EG	EE	Potassium Hydroxide, Concentrated	EE	EE	EE	EE	SS
Isobutyl Alcohol	EE	EE	EE	EG	EE	Potassium Permanganate	EE	EE	EG	EE	EE
Isopropanol	EE	EE	EE	EG	EE	Propane Gas	NN	EE	NN	NN	EE
Isopropanol, 100%	EE	EE	EE	EE	EE	Propionic Acid	FN	EF	EG	EF	EE
Isopropyl Acetate	GF	EG	GF	GF	EE	Propylene Glycol	EE	EE	EE	EE	EE
Isopropyl Alcohol	EE	EE	EE	EG	EE	Propylene Oxide	EG	EE	EG	EG	EE
Isopropyl Alcohol, 100%	EE	EE	EE	EG	EE	Pyridine	NN	NN	EE	FN	EE
Isopropyl Benzene	FN	FN	FN	NN	EE	Resorcinol, 5%	EE	EE	EE	EE	EE
Isopropyl Ether	NN	FN	NN	NN	EE	Resorcinol, Sat.	EE	EE	EE	EE	EE
Jet Fuel	FN	FN	FN	FN	EE	Salicylaldehyde	EG	EE	EG	EG	EE
Kerosene	FN	FN	FN	GF	EE	Salicylic Acid, Powder	EE	EE	EE	EE	EE
Lacquer Thinner	NN	FN	FN	FF	EE	Salicylic Acid, Sat.	EE	EE	EE	EG	EE
Lactic Acid, 3%	EG	EE	EE	EG	EE	Salt Solutions, Metallic	EE	EE	EE	EE	SS
Lactic Acid, 85%	EG	EE	EG	EG	EE	sec-Butanol	EE	EE	EE	EG	EE
Lead Acetate	EE	EE	EE	EE	EE	sec-Butyl Alcohol	EE	EE	EE	EG	EE
Magnesium Chloride	EE	EE	EE	EE	EE	Silicone Oil	EG	EE	EE	EE	EE
MEK	NN	NN	EG	FN	EE	Silver Acetate	EE	EE	EE	EE	EE
Mercuric Chloride	EE	EE	EE	EE	EE	Silver Nitrate	EG	EE	EE	EE	EE
Methanol	EG	EE	EE	EG	EE	Skydrol LD4	GF	EG	EG	EG	EE
Mercury	EE	EE	EE	EE	EE	Sodium Acetate, Sat.	EE	EE	EE	EE	EE
Methanol, 100%	EG	EE	EE	EG	EE	Sodium Carbonate	EE	EE	EE	EE	EE
Methoxyethyl Oleate	EG	EE	EG	EG	EE	Sodium Dichromate	EE	EE	EE	EE	EE
Methyl Acetate	EN	FF	GF	EE	EE	Sodium Hydroxide, 1%	EE	FF	EE	EE	SS
Methyl Alcohol	EG	-	EE	EG	EE	Sodium Hydroxide, 10%	EE	EE	EE	EE	SS
Methyl Alcohol, 100%	EG	EE	EE	EG	EE	Sodium Hydroxide, Concentrated (50%)	GG	EE	EE	EE	SS
Methyl Ethyl Ketone	NN	NN	EG	FN	EE	Sodium Hypochlorite, 15%	EF	EG	FN	EE	EE
Methyl Isobutyl Ketone	NN	NN	GF	FF	EE	Stearic Acid	EE	GG	EE	EE	EE
Methyl Propyl Ketone	NN	FN	GF	FF	EE	Stearic Acid, Crystals	EE	EE	EE	EE	EE
Methyl-t-Butyl Ether	NN	FN	FN	EE	EE	Sulfur Dioxide	NN	EN	EE	NN	EE
Methylene Chloride	NN	FN	FN	EN	EE	Sulfur Dioxide, Liquid	NN	FN	NN	NN	EE
MIBK	NN	NN	GF	FF	EE	Sulfur Dioxide, Wet or Dry Gas	EE	EE	EE	EE	EE
Mineral Oil	GN	EF	EF	EG	EE	Sulfur Salts	FN	GF	FN	FN	EE
Mineral Spirits	FN	FN	FN	EE	EE	Sulfuric Acid, 6%	EE	EE	EE	EE	EE
n-Amyl Acetate	GF	EG	GF	GF	EE	Sulfuric Acid, 20%	EE	EE	EE	EE	EE
n-Butanol	EE	EE	EE	EG	EE	Sulfuric Acid, 30%	EE	EE	EE	EE	EE
n-Butyl Acetate	GF	GF	GF	GF	EE	Sulfuric Acid, 60%	EG	EG	GF	EG	EE
n-Butyl Alcohol	EE	EE	EE	EG	EE	Sulfuric Acid, 98%	GG	FN	FN	GF	EE
n-Decane	FN	FN	FN	FN	EE	Sulfuric Acid, Concentrated (96%)	GG	FN	FN	GF	EE
n-Heptane	NN	FF	FF	FF	EE	Tartaric Acid	EE	EE	EE	EE	EE
n-Octane	EE	EE	EE	EE	EE	TCA	FN	FN	GF	EE	EE
Nitric Acid, 10%	EE	EE	EE	EE	EE	tert-Butanol	EG	EE	EG	EG	EE
Nitric Acid, 20%	EE	GG	FF	EE	EE	tert-Butyl Alcohol	EG	EE	EG	EG	EE
Nitric Acid, 50%	GF	FN	FN	FN	EE	Tetrahydrofuran	FN	FN	GF	FF	EE
Nitric Acid, 70%	EN	FN	NN	FN	EE	THF	FN	FN	GF	FF	EE
Nitrobenzene	NN	NN	NN	FN	EE	Thionyl Chloride	NN	NN	NN	NN	EE
Nitromethane	NN	FN	FN	EF	EE	Tincture of Iodine	EG	GF	EE	NN	EE
o-Dichlorobenzene	FN	NN	FN	FN	EE	Toluene	FN	NN	NN	FF	EE
Oil, Cedarwood	NN	FN	NN	NN	EE	Tributyl Citrate	GF	EG	GF	GF	EE
Oil, Cinnamon	NN	FN	NN	NN	EE	Trichloroacetic Acid	FN	FN	GF	EE	EE
Oil, Mineral	GN	EE	EE	EG	EE	Trichloroethane	NN	NN	NN	NN	EE
Oil, Pine	GN	FN	EG	GF	EE	Trichloroethylene	NN	NN	NN	NN	EE
Orange Oil	FN	GF	GF	FF	EE	Triethylene Glycol	EE	EE	EE	EE	EE
Oxalic Acid, 10%	EE	EE	EE	EE	EE	Tripropylene Glycol	EE	EE	EE	EE	EE
Ozone	GN	GN	FN	EE	EE	Tris Buffer, Solution	EG	EG	EG	EG	EE
p-Chloroacetophenone	EE	EE	EE	EE	EE	Trisodium Phosphate	EE	EE	EE	EE	EE
p-Dichlorobenzene	FN	NN	GF	GF	EE	Turpentine	FN	FN	FN	FN	EE
Perchloric Acid	GN	GN	GN	GN	EE	Undecyl Alcohol	EF	EG	EG	EG	EE
Perchloric Acid, Concentrated (70%)	GN	GN	GN	GN	EE	Urea	EE	EE	EE	EG	EE
Perchloroethylene	NN	NN	NN	NN	EE	Vinylidene Chloride	NN	FN	NN	NN	EE
Petroleum	NN	GN	NN	GF	EE	Xylene	NN	FN	NN	NN	EE
Phenol, 100%	NN	NN	NN	NN	EE	Zinc Chloride, 10%	EE	EE	EE	EE	EE
Phenol, 50%	NN	NN	NN	NN	EE	Zinc Stearate	EE	EE	EE	EE	EE
Phenol, Crystals	FN	GF	GN	FG	EE	Zinc Sulfate, 10%	EE	EE	EE	EE	EE