

Chemical Resistance of Polycarbonate Products



The mechanism of chemical attack on thermoplastic sheets differs significantly from the mechanism of corrosion of metals. Corrosion of metals results in a gradual loss of surface material as a result of electrolytic action by the relevant chemicals. In the cases where chemical attack on polycarbonate sheet occurs, all or a portion of a range of effects can be observed. Ethylene chloride, chloroform, tetrachloroethane, m-cresol, pyridine and other chemicals can cause partial dissolution of polycarbonate. Swelling agents include benzene, chlorobenzene, tetralin, acetone, ethyl acetate, acetonitrile and carbon tetrachloride. Additional effects include colour change and/or whitening. These effects may not always lead to product failure, especially for non-loaded sheets. Nevertheless, the level of measured mechanical properties will be reduced. The most critical effect of chemical attack is stress cracking or crazing, which may range in size from being visible to the naked eye to being only observable under a microscope. Stress cracks will always result in sheet failure, which will develop from areas of greatest stress (screws, fixings, bends, etc.) Polycarbonate sheets are generally not recommended for use with acetone, ketones, ethers, and aromatic and chlorinated hydrocarbons in addition to aqueous or alcoholic alkaline solutions, ammonia gas and its solutions and amines. Polycarbonate is resistant to mineral acids, many organic acids, oxidizing and reducing agents, neutral and acid salt solutions, many greases, waxes and oils, saturated, aliphatic and cycloaliphatic hydrocarbons and alcohols, with the exception of methyl alcohol. The resistance of polycarbonate to water may be described as good up to approximately 60 °C. At higher temperatures, degradation occurs, the extent of which depends on time and temperature. Polycarbonate should therefore not be exposed for long periods of time to hot water. However, brief contact with hot water has no effect. For example, polycarbonate tableware can be washed over 1000 times in a dishwashing machine with no adverse effects being observed. The table that appears in the following pages lists the resistance of polycarbonate sheets to a number of commonly encountered chemicals and other corrosive media at room temperature. (Information on chemical resistance at higher temperatures will be supplied upon request). Where the chemical resistance varies with concentration, the results of tests at different concentrations are presented. (Note that information on compatible adhesives and sealants can be found in a separate leaflet which will be supplied upon request) It serves as a basis for recommendation.

The table on the following pages uses the following key:

R – Resistant

LR - Limited Resistance (gradual attack over time may occur)

N - Not Resistant (rapid attack or attack over short time period will occur)

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| Chemical | Concentration % | Resistance | Chemical | Concentration % | Resistance |
|-----------------------------------|-------------------|------------|--------------------------------------|-----------------|------------|
| Acetaldehyde | | N | Bromine | | N |
| Acetic Acid | 10 | R | Bromobenzene | | N |
| Acetic Acid | 25 (concentrated) | LR (N) | Butane | | R |
| Acetone | | N | Butter | | R |
| Acetylene | | R | Butyl Acetate | | N |
| Acrylonitrile | | N | Butyl Alcohol (Butanol) | | R |
| Ajax Detergent | | R | Butylene Glycol | | R |
| Allspice | | N | Butyric Acid | | N |
| Allyl Alcohol | | LR | Calcium Chloride | Saturated | R |
| Alum (Aluminium Ammonium Sulfate) | | R | Calcium Hypochlorite | | R |
| Aluminium Chloride | Saturated | R | Calcium Nitrate | | R |
| Aluminium Oxalate | | R | Calcium Soap Fat | | R |
| Aluminium Sulfate | Saturated | R | Camphor Oil | | N |
| Ammonia (Gas) | | N | Carbolic Acid | | N |
| Ammonia (Aqueous) | | N | Carbon Bisulfite | | N |
| Ammonium Carbonate | | LR | Carbon Dioxide Gas (Moist) | | R |
| Ammonium Chloride | | R | Carbon Disulfide | | N |
| Ammonium Fluoride | | N | Carbon Monoxide | | R |
| Ammonium Hydroxide | | N | Carbon Tetrachloride | | N |
| Ammonium Nitrate | | R | Castor Oil | | R |
| Ammonium Sulfate | Saturated | R | Catsup (Ketchup) | | R |
| Ammonium Sulfide | | N | Caustic Potash (Potassium Hydroxide) | | N |
| Amyl Acetate | | N | Caustic Soda (Sodium Hydroxide) | | N |
| Amyl Alcohol | | LR | Chlorine Gas (Dry) | | LR |
| Aniline | | N | Chlorine Gas (Wet) | | N |
| Antimony Trichloride | Saturated | R | Chlorobenzene | | N |
| Aqua Regia | | LR | Chloroform | | N |
| Arsenic Acid | 20 | R | Chocolate | | R |
| Automatic Switch Grease | | R | Chrome Alum | Saturated | R |
| Automotive Waxes | | LR | Chromic Acid | 20 | R |
| Baby lotion | | R | Cinnamon | | R |
| Bacon Fat | | R | Citric Acid | 10 | R |
| Barium Chloride | | R | Cloves | | N |
| Battery Acid | | R | Coal Gas | | R |
| Beer | | R | Coca Cola | | LR |
| Beet Syrup | | R | Cocoa | | LR |
| Benzaldehyde | | N | Cod Liver Oil | | R |
| Benzene | | N | Coffee | | LR |
| Benzoic Acid | | N | Cooking Oil | | R |
| Benzyl Alcohol | | N | Copper Sulfate | Saturated | R |
| Betadine | | R | Cresol | | N |
| Bleach (Clorox) | | R | Cupric Chloride | Saturated | R |
| Blood and Blood Plasma | | R | Cuprous Chloride | Saturated | R |
| Borax | | R | Cyclohexane | | R |
| Boric Acid | | R | Cyclohexanol | | LR |
| Brake Fluid | | N | Cyclohexanone | | N |

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|-----------------------------------|-------------------|------------|-------------------------------|-----------------|------------|
| DDT | | R | Hydrogen Sulfide | | R |
| Dekalin | | R | Iodine (Aqueous Solution) | 5 | R |
| Detergent (most) | | LR or R | Iodine | | N |
| Developing Solutions | | N or LR | Inks (Most) | | R |
| Diamyl Phthalate | | N | Isoamyl Alcohol | | LR |
| Diesel Fuel | | R | Isopropyl Alcohol | | R |
| Diethyl Ether (Ethyl Ether) | | N | Kerosene | | N |
| Dimethyl Formaldehyde (DMF) | | N | Lactic Acid | 20 | R |
| Demethyl Sulfoxide (DMSO) | | N | Lacquers and Thinners | | N |
| Dinonyl Phthalate (Plasticiser) | | LR | Laundry Detergents (Most) | | LR or R |
| Doctyl Phthalate (plasticiser) | | LR | Ligroin (Hydrocarbon Mixture) | | R |
| Dioxane | | N | Lime Solution (2%) or Paste | | R |
| Diphyl 5,3 | | LR | Liquors or Liqueurs | | R |
| Ethanol (Ethyl Alcohol) and Water | 96 | R | Linseed Oil | | R |
| Ethanol (Ethyl Alcohol) | Pure | LR | Loctite | | N |
| Ethyl Amine | | N | Lubricating Oils (Most) | | LR or R |
| Ethyl Acetate | | N | Machine Oils (Most) | | R |
| Ethyl Bromide | | N | Magnesium Chloride | Saturated | R |
| Ethylene Chloride | | N | Magnesium Sulfate | Saturated | R |
| Ethylene Chlorohydrin | | N | Manganese Sulfate | Saturated | R |
| Ethylene Dichloride | | N | Margarine | | R |
| Ethylene Glycol (Antifreeze) | | LR | Mayonnaise | | R |
| Ferric Chloride | Saturated | R | Meat | | R |
| Ferrous Sulfate | | R | Mercuric Chloride | Saturated | R |
| Fish and Fish Oils | | R | Mercury | | R |
| Floor Polish | | R | Methane | | R |
| Formalin | 10 | R | Methanol (Methyl Alcohol) | Pure | LR |
| Formic Acid | 10 (30) | R (LR) | Methylamine | | N |
| Freon TF | | R | Metylcellulose | | N |
| Freon (all others) | | N | Methylene Chloride | | N |
| Fruit Juices and Pulp | | R | Methyl Ethyl Keton (MEK) | | N |
| Gasoline | | N | Methylmethacrylate | | N |
| Gear Oil | | R | Milk | | R |
| Glazers Putty | | R | Mineral Oil | | R |
| Glucose | | R | Motor Oils | | LR or R |
| Glycerine | | R | Mustard | | R |
| Glycerol | | R | Naphtha (Stanisol) | | N |
| Glycols | | R | Nickel Sulfate | | R |
| Glutaraldehyde | 50 | R | Nitric Acid | 20 | R |
| Grease, Automotive (Most) | | R | Nitrobenzene | | N |
| Heptane | | R | Nitropropane | | N |
| Hexane | | R | Nitrous Oxide | | N |
| Hydrazine | | N | Nutmeg | | N |
| Hydrochloric Acid | 20 (concentrated) | R (N) | Oleic Acid | | R |
| Hydrofluoric Acid | 20 | R | Onions | | R |
| Hydrogen Peroxide | 30 | R | Oxalic Acid | 10 | R |

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|------------------------------------|-------------------|------------|------------------------------|-----------------|------------|
| Oxygen | | R | Soap (Ivory) | | R |
| Ozone | | N | Sodium Bicarbonate | Saturated | R |
| Paprika | | R | Sodium Bisulfate | Saturated | R |
| Paraffin | | R | Sodium Bisulfite | Saturated | R |
| Pentane | | R | Sodium Carbonate | Saturated | R |
| Pepper | | R | Sodium Chlorate | | R |
| Perchloric Acid | 10 (concentrated) | R (LR) | Sodium Chloride | Saturated | R |
| Perchloroethylene | | N | Sodium Chromate | Saturated | R |
| Petroleum | | LR | Sodium Hydroxide | | N |
| Petroleum Ether | | LR | Sodium Hypochlorite | 5% Chlorine | R |
| Petroleum Oil (Refined) | | R | Sodium Nitrate | | N |
| Phenol | | N | Sodium Sulfate | Saturated | R |
| Phosphoric Acid | 10 | R | Sodium Sulfide | | N |
| Phosphorous Oxychloride | | R | Sodium Thiosulfate | | R |
| Phosphorous Pentoxide | 25 | LR | Spindle Oil | | R |
| Phosphorous Trichloride | | N | Stannous Chloride | | R |
| Polyethylene | | R | Starch | | R |
| Polyethylene Glycol | | R | Styrene | | N |
| Potassium Acetate | | LR | Sugar | Saturated | R |
| Potassium Aluminium Alum (Sulfate) | Saturated | R | Sulfur Dioxide (Gas) | | R |
| Potassium Bichromate | | R | Sulfuric Acid | <50 (50<70) | R (LR) |
| Potassium Bromate | | R | Sulfurous Acid | 10 | N |
| Potassium Bromide | | R | Sulfuryl Chloride | | N |
| Potassium Chloride | Saturated | R | Tapping Oil | | R |
| Potassium Cyanide | | N | Tartaric Acid | 30 | R |
| Potassium Dichromate | Saturated | R | Tear Gas (Chloracetophenone) | | LR |
| Potassium Hydroxide | | N | Terpineol | | N |
| Potassium Metabisulfide | 4 | R | Tetrahydrofuran | | N |
| Potassium Nitrate | Saturated | R | Tetralin | | N |
| Potassium Perchlorate | 10 | R | Thiophene | | N |
| Potassium Permanganate | 10 | R | Thyme | | R |
| Potassium Persulfate | 10 | R | Titanium Tetrachloride | | R |
| Potassium Rhodanide | Saturated | R | Tobacco | | R |
| Potassium Sulfate | Saturated | R | Toluene | | N |
| Propane | | R | Transformer Oils | | R |
| Propargyl Alcohol | | R | Transmission Fluid | | R |
| Propionic Acid | 20 | R | Trichloroacetic Acid | 20 | LR |
| Propionic Acid | Concentrated | N | Trichloroethylamine | | N |
| Propyl Alcohol (1-Propanol) | | R | Trichloroethylene | | N |
| Pyridine | | N | Trichloroethylphosphate | | LR |
| Salad Oil | | R | Tricresylphosphite | | N |
| Salt | | R | Trisodium Phosphate | | R |
| Silicofluoric Acid | 30 | R | Turpentine | | LR |
| Silicone Grease | | R | Urea | | R |
| Silicone Oil | | R | Vacuum Pump Oil | | R |
| Silver Nitrate | | R | Vanilla | | R |

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|-----------------------------------|-----------------|------------|-----------------|-----------------|------------|
| Vanillin | | R | Witch Hazel | | R |
| Varnish | | N | Worcester Sauce | | R |
| Vaseline | | R | Xylene | | N |
| Vegetable Juices | | R | Zinc Chloride | | R |
| Vinegar | | R | Zinc Oxide | | R |
| Water (Demineralised or Sea) | | R | Zinc Stearate | | R |
| White Spirit | | N | Zinc Sulfate | | R |
| Wine, Whiskey, Vodka, Rum, Cognac | | R | | | |