Shell Chemicals

Shell Plastics

Chemical resistance data for Shell Polypropylene

Thermoplastics
Technical Manual
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Technical bulletin

The information given in this bulletin is confined to the effects of various products on Shell Polypropylene – not vice versa.

Where foodstuffs, toys, medical devices, or other applications where questions of health, safety or hygiene are concerned, special criteria apply, and users should satisfy themselves that the necessary conditions are met.

The data were obtained by laboratory methods described below, which may not be representative of the actual conditions of use encountered in particular applications, and further testing may be necessary.

The test results in this bulletin were determined by using a 4-ounce Boston round bottle blow moulded of Shell Polypropylene. This is filled about ¾ full with the particular reagent being tested. A test piece of polypropylene, about 2½ ins x ⅜ins x ⅛ins is then partially submerged in the reagent and the bottle is maintained in an oven at a carefully controlled temperature for the duration of the test.

Chemical resistance is evaluated through several observations on the test piece:

1. The surface is visually analysed for evidence of oxidative attack, ESC, staining and dimensional distortion.
2. Any weight gain in the sample is evidence of swelling caused by solvent absorption.
3. The sample is tested for signs of physical deterioration, such as embrittlement, softening, decreased yield stress and increased yield elongation.

In the following tables, overall chemical resistance is evaluated through the use of three rating symbols – S, M and U, which have the following significance:

S – **Satisfactory**. Little or no noticeable effect, with no indication that serviceability is impaired.

M – **Marginal**. Noticeable effect, but not necessarily indicating a lack of serviceability or useful life. Further testing is recommended in the specific application.

U – **Unsatisfactory**. Severe effect and not recommended for service applications.

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Acetaldehyde	20	180	M
	50	180	M
Acetate solvents, pure	23		M
Acetic acid (5%)	23	365	S
	60	30	S
Acetic acid (10%)	21	100	S
	60	100	M
Acetic acid (20%)	23		S
Acetic acid (50%)	23	30	S
	80	30	M
Acetic acid (glacial) (100%)	20	180	S
	50	180	S
	60	100	M
Acetone (DMK)	20	30	S
	20	100	M
	50	180	M
	60	100	M
Acetophenone	23		S
Acetylene	23		S
Acriflavine (2% aq. sol'n)	80		S
Acrylic emulsions	60		S
Allyl chloride	20		M
	60		U
Almond oil	23	117	S
Aluminum chloride	100		S
Aluminum sulphate	23		S
Alums	23		S
Ammonia (15% sol.)	23	30	S
Ammonia (25%)	23	180	S
	60	180	S
Ammonia (30%)	23	365	S
Ammonia, concen.	23	100	S
Ammonia (gas-liquid)	23		S
Ammonium acetate	23		S
Ammonium bicarbonate	60		S
Ammonium carbonate	23		S
Ammonium chloride	23		S
Ammonium fluoride	100		S
Ammonium hydroxide (10% aqueous sol.)	23	365	S
Ammonium metaphosphate	100		S
Ammonium nitrate	23		S
Ammonium persuphate	100		S
Ammonium phosphate	23		S
Ammonium sulphate	23		S

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Ammonium thiocyanate	100		S
Amyl acetate	23		S
Amyl alcohol	100		S
Amyl chloride	20		M
	60		M
Aniline	20	180	S
	50	180	M
	60	30	S
Anisole	20		S
	60		M
	100		U
Anti-freeze	20	180	S
	50	180	S
Antimony chloride, sat'd	60		S
	100		M
Apple juice	23	43	S
Aqua regia	20		S
	60		M
	100		U
Aromatic hydrocarbons	23		U
Asphalt	23		U
Barium carbonate	100		S
Barium chloride	100		S
Barium hydroxide	100		S
Barium salts	23		S
Barium sulphate	100		S
Barium sulphide	100		S
Beer	23	30	S
Beet juice	23		S
Benzaldehyde	23		M
Benzene/Benzol	20	180	U
Benzene sulphonic acid	60		M
Benzoic acid	23		S
Benzoyl chloride	23		S
Benzyl alcohol	50	180	S
Bismuth carbonate	100		S
Bluing	23		S
Borax	23		S
Boric acid	23		S
Brandy	23		S
Brine solution	23	365	M
Bromine gas	20		M
	60		U
Bromine liquid	20		M
	60		M

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Bromine water, sat'd	23		M
Butane	23		M
Butanol	23		S
Butter	23		S
Butyl acetate	23	365	S
Butyl phthalate	23	90	S
	80	30	S
Calcium bisulphite	23		S
Calcium carbonate	100		S
Calcium chlorate	100		S
Calcium chloride (2.5% aqueous solution)	23	365	S
Calcium chloride (50% solution)	80	30	S
Calcium hydroxide	100		S
Calcium hypochlorite	23		S
Calcium nitrate (50% sol'n.)	100		S
Calcium phosphate	20		S
Calcium salts	23		S
Calcium sulphate	100		S
Calcium sulphite	100		S
Camphor oil	23	86	U
Cane sugar liquors	23		S
Carbon bisulphide	23	365	U
Carbon dioxide, dry	23		S
Carbon dioxide, wet	23		S
Carbon dioxide solution	60		S
Carbon disulphide	23	365	U
Carbon monoxide	60		S
Carbon tetrachloride	23	365	U
	60	100	U
Carbonic acid	60		S
Carrot oil	23		S
Castor oil	60	91	S
Caustic soda, conc.	23	100	S
Caustic soda, dil.	23	100	S
Cetyl alcohol	20		S
Chlorobenzene	20	180	U
Chlorinated water, sat'd	20		S
	60		M
Chlorine gas (wet)	23		U
Chlorine gas (dry)	23		U
Chlorinated hydrocarbons	23		M
Chloroform	23	365	U
Chlorosulphonic acid	23		U
Chrome alum	100		S
Chocolate syrup	23		S
Chromic acid (10%)	23	365	S
Chromic acid (30%)	23		S
Chromic acid (40%)	60	30	S
Chromic acid, 2 N	23		S
Cider	60		S
Citric acid (10%)	20	180	S
	60	30	S
Citric acid, 2 N	23	365	S
Citrondropar (lemon)	50	109	S
Clove oil	23	302	M
	60	159	M
Coconut oil	23	162	S
Cod liver oil	23	96	S
Coffee	23		S
Coke oven gas	23		S
Copper salts	23		S
Copper sulphate	23		S
Cottonseed oil	60	113	S
Creosote	23		S
Cresal	23		U
Cresol	20		S
Cupric chloride	60		S
Cupric cyanide	60		S
Cupric fluoride	60		S
Cupric nitrate	60		S
Cupric sulphate	60		S
Cuprous chloride	60		S
Cyclohexane	20	180	M
	50	180	M
Cyclohexanol	20	180	S
	50	180	S
Cyclohexanone	20	180	M
	50	180	M
DDT spray	20		S
Decalin	23		U
Developers (photographic)	60		S
Dextrine	60		S
Dextrose	60		S
Diacetone alcohol	50	180	S
Diazo salts	60		S
Dibutyl phthalate	23		M
Dichloroethylene	23		S
Diethanolamine	60		S
Diethyl carbonate	20		S
	60		M
Diethylene glycol	60		S
Di-iso-octyl phthalate	60		S
Dimethyl ether	20		M
	60		M
Dimethyl formamide	60	30	S
Dimethylamine	20	180	S
	50	180	M
Dioctyl phthalate (DOP)	21	100	M
	60		M
Dioxane	23		M
Disodium phosphate	60		S
Distilled water	23	78	S
	60	160	S
Dobanic acid	60		S
Epichlorohydrin	20	180	S
	50	180	S
Ethanol (50% aqueous solution)	23	365	S
Ethanol (95%)	23	365	S

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Ethanolamine	60		S
Ethers	23		S
Ethyl acetate	23	365	M
	50	180	M
	60	100	M
Ethyl alcohol	23	365	S
	60	100	S
Ethyl alcohol (50%)	20	30	S
Ethyl alcohol (50%)	60	30	S
Ethyl alcohol (95%)	23	100	S
	60	30	S
Ethyl chloride	20		M
	60		M
Ethylene chloride	20		M
	60		M
Ethyl ether	20	180	M
Ethylene di-chloride	21	30	M
Ethylene glycol	23	365	S
Ethylene oxide	10		M
Ethyl oleate	20		S
	60		M
	100		M
Fatty acids, C^6	60		S
Ferric chloride	23		S
Ferric nitrate	60		S
Ferrous chloride	23		S
Ferrous sulphate	23		S
Fish	23		S
Fluosilicic acid	60		S
Formaldehyde, (35% solution)	22	90	S
Formaline, (40% solution)	23		S
Formic acid (85%)	22	30	S
Formic acid (anhydrous)	23	365	S
'Freon'	23		M
Fructose	60		S
Fruit juice	60		S
Fruit pulp	60		S
Fuming nitric acid	23		U
Furfural	20		M
	60		M
Furfurol	23		S
Gas oil	50	180	S
Gasoline	23	100	M
	23	365	M
	60	100	M
Gasoline (aviation)	23	365	M
Gasoline (sour)	23		M
Gearbox oil	20		S
	60		M
Gelatine	23		S
Glucose	23		S
Glue	23		S
Glycerine	60		S
Glycolic acid (30%)	60		S
Glycerol	50	180	S
Grape sugar	60		S
Grease	20		S
Green soap solution	23	365	S
Heavy duty detergent	60	30	S
Heptane	23	180	M
Hexane	23	365	M
Household detergent	60	100	S
Household ammonia solution	23		S
Household soap	23		S
Hydrobromic acid	60		S
Hydrochloric acid (conc.) (38%)	23	100	S
Hydrochloric acid (10% aqueous solution)	23	365	S
	60	100	S
Hydrochloric acid (30%)	23	365	S
Hydrochloric acid (35%)	20	180	S
	23	100	S
	60	100	M
Hydrochloric acid (36%)	22	90	S
	80	10	S
Hydrochloric acid (50%)	23		S
Hydrochloric acid, 2N	23	365	S
Hydrocyanic acid	23		S
Hydrofluoric acid, dil.	23		S
Hydrofluoric acid (38%)	23	30	S
Hydrofluoric acid (40%)	60	30	S
Hydrofluoric acid (50%)	23		S
Hydrofluoric acid, techn.	22	90	S
Hydrogen bromide (10%)	60		S
Hydrogen chloride gas, dry	60		S
Hydrogen fluoride	23		S
Hydrogen	23		S
Hydrogen peroxide (3% solution)	23	100	S
	23	365	M
Hydrogen peroxide (28% solution)	23	30	S
	60	30	U
Hydrogen sulphide, dry	23		S
Hydrogen sulphide (wet + aqueous solution)	23		S
Hydroquinone	60		S
Igepal	23	365	S
Ink, washable	23		S
Iodine solution	23		S
Iodine (in alcohol)	23	365	S
Iosan	60	30	S
Isopropyl alcohol	50	180	S
Isopropyl ether	20	180	M
	50	80	M
Isooctane	23	30	M
	60	30	M
Karo syrup	23		S

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Kerosine	20	180	S
	50	180	M
	60	100	M
Kerosine (No.2 fuel oil)	23	30	M
	60	30	U
Lacquer and lacquer solvents	23		M
Lactic acid	23		S
Lactic acid (20%)	23	365	S
Lanolin	60		S
Lead acetate	23		S
Lemon oil	23	65	M
	60	14	M
Lime sulphur	23		S
Linseed oil	23	365	S
Linseed oil (blue)	23	30	M
	23	100	M
Lubricating oil	60	100	M
Machine oil	23		S
Magenta dye (2% soln.)	60		S
Magnesium chloride	23		S
Magnesium carbonate	100		S
Magnesium hydroxide	100		S
Magnesium sulphate	100		S
Magnesium sulphide	100		S
Malic acid	23		S
Manganese salts	23		S
Mayonnaise	23		S
Meat sauce	50	180	S
Mercuric cyanide	60		S
Mercurochrome	23		S
Mercuric chloride	23		S
Mercurous nitrate	60		S
Mercury	23		S
Methyl alcohol (100%)	23	365	S
	60	30	S
Methyl bromide	20		M
	60		U
Methyl ethyl ketone	20	180	M
	50	180	M
Methyl isobutyl carbinol	50	180	S
Methyl isobutyl ketone	21	100	S
	60	100	U
Methylene chloride	23		M
Milk	23	30	S
Mineral oil (white)	60	30	M
Molasses	23		S
Monochloracetic acid	60		S
Motor oil (Shell X-100)	50	180	S
	60	100	S
Mustard paste	23		S
n-Heptane	60	100	M
Naphtha	20		M
Naphthalene	20		M
	60		M
	100		M
Natural gas	23		S
Neatsfoot oil	23	103	S
	60	110	S
Nickel chloride	23		S
Nickel nitrate	100		S
Nickel salts	23		S
Nickel sulphate	23		S
Nitric acid, conc.	23	365	S
	50	180	S
	60	30	U
Nitric acid, dil (10%)	21	100	S
	60	100	M
Nitric acid, (30%)	23	100	M
Nitric acid (40%)	23	365	M
	60	30	U
Nitric acid conc. (50%)	21	100	M
	60	100	U
Nitric acid (75%)	20	180	M
Nitric acid, fuming	23	365	U
Nitrobenzene	20	180	S
	50	180	S
	60	100	U
Nitrogen oxides	23		S
Nitrous acids	23		S
Nutmeg oil	23	82	U
Oils, vegetables	23		S
Oleic acid	50	180	S
	60	30	U
Oleum	20		U
Olive oil	23	365	S
	60	152	S
Oxalic acid	50	180	S
Oxalic acid (50%)	23	365	S
Oxygen gas	23		S
Palmitic acid	23		S
Paraffin wax	60		S
Paraldehyde	20		M
	60		M
Peanut oil	23	133	S
	60	73	S
Peppermint oil	23	196	S
	50	95	M
Perchloric acid	23		S
Petroleum oils, sour	23		M
Petroleum oils, refined	23		S
Phenol	60	100	S
Phenol solution (5%)	23	365	S
	60	30	S
Phosphoric acid (25%)	23		S
Phosphoric acid (25-50%)	23		S
Phosphoric acid (85%)	60	100	S
Phosphorous oxychloride	20		M
Picric acid	23		M
Plating solutions: Brass, cadmium, chromium copper, lead, gold, indium, nickle, rhodium, silver, tin, zinc.	60		S

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Potassium bichromate/	21	100	M
sulphuric acid/water	60	100	M
(5/100/5)			
Potassium bicarbonate	60		S
Potassium borate	60		S
Potassium bromate	60		S
Potassium bromide	60		S
Potassium carbonate	23		S
Potassium chlorate	23		S
Potassium chloride	23		S
Potassium chromate	60		S
Potassium cyanide	100		S
Potassium ferricyanide	60		S
Potassium ferri/ferrocyanide	100		S
Potassium fluoride	100		S
Potassium hydroxide	50	180	S
tassium hydroxide (50%)	23	365	S
Potassium iodide	23		S
Potassium nitrate	100		S
Potassium perborate	60		S
Potassium perchlorate (10%)	60		S
Potassium persulphate	60		S
Potassium permanganate			
solution	21	100	M
	60	100	M
Potassium sulphate	23		S
Potassium sulphide	100		S
Potassium sulphite	100		S
Propane	23		M
Propionic acid	20		S
	60		M
Propylene dichloride	20		M
	60		M
Pyridine	23		S
Rice barn oil	23	106	S
	60	111	S
Rosin (light)	23		S
Safflower oil	23	161	S
	60	63	S
Sauerkraut	23		S
Shell X-100	50	180	S
Shellac	23		S
Shoe polish (liquid)	23		S
Sea water	100		S
Silica gel	100		S
Silicone oil	23	365	S
Silver nitrate	23		S
Soap solution (1%)	60	30	S
Soap solution (5%)	60	100	S
Soapless detergent	23		S
Sodium acetate	100		S
Sodium benzoate (35%)	100		S
Sodium bicarbonate	23		S
Sodium bisulphate	23		S
Sodium bisulphite	23		S
Sodium borate	23		S

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Sodium bromide	60		S
Sodium bromide oil sol'n	60		S
Sodium carbonate	23	365	S
Sodium carbonate,	80	30	S
satur. solution			
Sodium carbonate (2% sol'n)	60	30	S
Sodium carbonate (2.5			
aqueous solution)	23	365	S
Sodium carbonate			
(20% solution)	60	30	S
Sodium chlorate	23		S
Sodium chloride,	23	90	S
solution	80	30	S
Sodium chloride	23	365	S
(10% solution)	60	30	S
Sodium chlorite (2%)	60		S
Sodium chlorite (20%)	20		S
	60		M
Sodium chlorite (30%)	20		S
	60		M
Sodium chromate	60		S
Sodium cyanide	23		S
Sodium dichromate	100		S
Sodium ferricyanide	100		S
Sodium ferrocyanide	100		S
Sodium hydroxide	23	365	S
(1% solution)	60	30	S
Sodium hydroxide	22	90	S
(30% solution)	80	30	S
Sodium hydroxide,	21	365	S
(50%)	60	100	S
Sodium hydroxide	60	30	S
(60% solution)			
Sodium hypochlorite	50	180	S
Sodium hypochlorite (5%)	23	30	S
	60	30	M
Sodium hypochlorite	23	30	M
(10% sol'n)	23	100	M
Sodium hypochlorite sol'n	21	100	M
Conc.	60	100	M
Sodium metaphosphate	23		S
Sodium nitrate	23		S
Sodium palmitate	23	100	S
(5% solution)			
Sodium perborate	23		S
Sodium phosphate, alkaline	23		S
Sodium phosphate, acid	23		S
Sodium phosphate, neutral	23		S
Sodium silicate	100		S
Sodium sulphate	23		S
Sodium sulphide	23		S
Sodium sulphite	23		S
Sodium thiosulphate	23		S
Soybean oil	60	117	S
Spindle oil	21	100	S
	60	100	M

Chemical exposure performance of Shell Polypropylene

Reagent (Solids in saturated solution unless indicated otherwise)	Exposure		Chemical exposure performance
	Temp., °C	Time, days	
Stannic chloride	100		S
Stannous chloride	60		S
Starch	100		S
Stearic acid	23		S
Succinic acid	23		S
Sugars and syrups	100		S
Sulphite liquors	23		S
Sulphur	23		S
Sulphamic acid	80		S
Sulphur dichloride	20		S
Sulphur chloride	23		S
Sulphur dioxide (dry)	23		S
Sulphur dioxide (wet)	23		S
Sulphuric acid (3%)	23	365	S
	60	30	S
Sulphuric acid, dil. (10%)	60	100	S
Sulphuric acid (30%)	60	30	S
Sulphuric acid (50%)	22	90	S
	80	10	S
Sulphuric acid (96%)	22	90	S
	80	10	S
Sulphuric acid (97%)	23	365	S
Sulphuric acid, conc. (98%)	50	180	S
	60	100	M
Sulphurous acid	23		S
Super Shell	20	180	M
	50	180	M
Tallow	60		S
Tannic acid	23		S
Tar	23		S
Tartaric acid	23		S
Tea	23		S
Teepol 514 solution (27%)	23	100	S
Tetrahydrofurane	23		S
Tetralin	23		M
Thiopen	23		S
Toluene	23	365	M
	60	100	M
Tomato	23		S
2T oil	50	180	S
Transformer oil	23	30	M
	60	30	U
Transformer oil, DTE/3D	22	90	M
	80	30	M
Trichloracetic acid, 2N	23		S
Trichloroethylene	23		U
Triethanolamine	60		S
Tri-sodium phosphate	23		S
Turpentine	23	365	M
	60	30	U
Two-stroke oil	21	100	S
	60	100	M
Urea	23		S
Vanillindropar (vanilla)	20	109	S
	50	86	S
Varnish	23		S
Vaseline	50	180	S
Vaseline oil	22	90	S
	80	30	S
Vinegar	50	180	S
Wax crayon	23		S
Wesson oil	22	30	S
Wheat germ oil	23	160	S
	60	58	S
Whiskey	23		S
White paraffin	80		S
White spirit (low aromatic content)	23	100	U
White spirit (high aromatic content)	23	100	U
Wines	23	30	S
Xylene	20	180	M
	23	365	M
	50	180	M
	60	100	M
Yeast	60		S
Zinc chloride	23		S
Zinc oxide	60		S
Zinc sulphate	23		S