



مقاومت لوله های پلی اتیلن در برابر مواد شیمیائی

پلی اتیلن بطور کلی در برابر مواد شیمیائی دارای ثبات می باشد. طبق آزمایشات انجام شده HDPE در اکثر حلالهای معدنی وآلی در ۲۰ درجه سانتیگراد غیر محلول است ولی در درجه حرارت بالاتر از ۹۰ درجه سانتیگراد به میزان خیلی کمی در ئیدروکربورهای زنجیری و حلقی و مشتقات کلره آنها حل می گرددند. پلی اتیلن سخت به مرور زمان در درجات حرارت معمولی (۲۰ درجه سانتیگراد) تحت اثر هالوژنهای مانند کلر، برم و غیره ضمن ایجاد اسیدهای هالوژنهای مربوطه تبدیل به پلی اتیلن هالوژنه می شود. این پلی اتیلن هالوژنه با اینکه دارای خواص فیزیکی و شیمیائی غیر از پلی اتیلن سخت اولیه می باشد، حالت و مورد استعمال خود را محفوظ می دارد. به همین دلیل تحت شرایط بخصوصی میتوان لوله و اتصالات پلی اتیلن سخت را حتی در کارخانجاتی که محصولاتشان هالوژنهای می باشد و یا از هالوژنهای استفاده می نمایند بکار برد. البته در این مورد باید هدف مورد استعمال و غلظت هالوژنهای را در نظر گرفت.

لیست کاملی از مواد شیمیائی موثر و یا غیر موثر بر لوله های پلی اتیلن ذیلا آورده شده است :

Chemical Resistance of HDPE Pipe Resins

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Acetaldehyde & Acetic Acid	R	—	—	—	Aryl sulfonic acid	R	—	—	—
Acetaldehyde (aqueous)	all	R to C	C	C to N	Ascorbic acid	R	—	R	—
Acetamide	R	—	R	—	Asphalt	R	—	C	—
Acetic acid	100% (glacial)	R	C to N	C to N	Aspirin	R	—	R	—
Acetic acid	50%, 60%, 70%, 80%	R	C	R to C	Barium salts	all	R	R	R
Acetic acid	10%, 20%	R	—	R	Barium hydroxide (aqueous)	all	R	R	R
Acetic acid vapor	R	R	==	—	Battery acid	R	—	R	—
Acetic anhydride	100%	R	—	C	Beater glue	R	—	R	—
Acetoacetic acid	R	—	—	—	Beer	R	—	R	—
Acetone, 100%	R to C	C	C	—	Beet sugar liquor	R	—	—	—
Acetophenone	R	—	—	—	Beeswax	R	C	C to N	—
Acetylene	R	—	—	—	Benzaldehyde (aqueous)	10%	R	—	C
Acids aromatic	R	—	R	—	Benzaldehyde in isopropyl alcohol	1%	R	—	R
Acronal® dispersions - usual commercial	R	—	C	—	Benzene	pure	C	C to N	C to N
Acrylic acid emulsions	R	—	R	—	Benzene Sulfonic acid	all	T to C	—	R to C
Acronitrile	technically pure	R	—	R	Benzoic acid (aqueous)	all	R	R	R
Adipic acid, saturated sol.	R	—	R	—	Benzoyl chloride	C	—	N	—
Adipic acid ester	R	—	C	—	Bichromate-sulphuric acid	concentrated	R	—	N
Akivin® (chloramine) (aqueous)	1%	R	—	R	Bismuth salts	R	—	R	—
Alcohol, allyl	R	C	C	—	Bisulphite solution	R	—	R	—
Alcohol, amyl	technically pure	R	C	R to C	Bitumen	R	—	C	—
Alcohol, benzyl	R to C	C	R	—	Black liquor-paper	R	R	—	—
Alcohol, (n-butanol)	R	R	R	—	Bleach liquor (12.5% active chlorine)	R	N	N	—
Alcohol, (2-butanol)	R	R	—	—	Bleach liquor (5.5% active chlorine)	R	R	R	—
Alcohol, ethyl	R	C	R to C	—	Bone oil	R	—	R	—
Alcohol, hexyl	R	R	R	—	Borax	R	R	R	—
Alcohol, isopropyl (2-propanol)	R	R to C	R to N	—	Boric acid (aqueous)	all	R	R	R
Alcohol, methyl	R	R	R to C	—	Boric acid (methylester)	R	—	C to N	—
Alcohol, propyl (1-propanol)	R	R	R	—	Boron trifluoride	R	C	C	—
Allyl acetone	R	—	R to C	—	Brake fluid	R	—	R	—
Aluma (aqueous)	all	R	R	R	Brandy - wine	R	—	—	—
Aluminum salts (chloride, fluoride hydroxide, metaphosphate, sulphate)	R	R	R	—	Brine	saturated	R	R	R
Amino acids	R	—	R	—	Bromic acid	R	N	—	—
Ammonia, gas	R	R	R	—	Bromine (gas)	M	N	N	—
Ammonia, liquid	R	—	R	—	Bromine (aqueous)	C	N	N	—
Ammonia (aqueous)	R	R	R	—	Bromine (liquid)	N	N	N	—
Ammonium salts (acetate, carbonate chloride, fluoride 10-25%, hydrosulphide, hydroxide, metaphosphate nitrate, phosphate, sulphate, sulphide, thiocyanate)	R	R	R	—	Bromochloromethane	N	—	—	—
Amyl acetate	technically pure	R to C	C to N	C	Butanediol (aqueous)	all	R	R	R
Amyl chloride	100%	C	—	N	Butadiene	R	C	—	—
Amyl phthalate	R	—	C	—	Butane tetrol (crythritol)	N	N	—	—
Analine (aqueous)	all	R	C to N	C to N	Butane, gas	R	R	R	—
Analine chlorhydrate	C	—	—	Butanetriol (aqueous)	all	R	—	R	—
Analine hydrochloride (aqueous)	all	R to C	—	R	Butaxyl® (methoxylbutyl acetate)	R	—	C	—
Analine dyes	C	—	—	Butter	R	—	R	—	—
Animal oils	R	—	R to C	—	Butyl acetate	R to C	C	C to N	—
Aniseed oil	C	—	N	—	n-Butyl acetate	R	—	C	—
Anisole	C	—	C to N	—	Butyl acrylate	R	—	C	—
Antifreeze	R	—	R	—	Butyl benzyl phthalate	R	—	R	—
Anthraquinone	C	—	—	Butylene glycol	R	—	R	—	—
Anthraquinone sulfonic acid	R	—	R	—	Butylene	R	R	—	—
Antimony chloride, pentachloride	R	—	R	—	Butyl phenol	R to C	C	R	—
Antimony trichloride	R	R	R	—	Butyric acid (aqueous)	all	R	C	C
Aqua Regia	N	N	N	—	Calcium chloride	R	R	—	—
Arsenic acid (anhydride)	R	—	R	—	Calcium salts (aqueous)	R	R	R to C	—
Arsenic acid (aqueous)	R	R	R	—	Camphor oil	N	—	N	—
				—	Camphor (crystals)	R	C	C	—
				—	Calcium hydroxide	R	R	R	—
				—	Cane sugar liquors	R	R	R	—
				—	Carbazole	R	—	R	—

Chemical Resistance of HDPE Pipe Resins, continued

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Carboxlic acid		R	—	R	Crotonaldehyde	pure	R to N	N	C
Carbolineum for fruit trees (aqueous)		R	—	C	Cresylic acid	50%	C	—	—
Carbon bisulfide		C to N	N	N	Cyclanone	usual commercial concentration	R	—	R
Carbon dioxide (wet or dry)		R	R	R	Crude oil		C	C	—
Carbonic acid (aqueous)	all	R	R	R	Cyclohexane		R	C	R to N
Carbon monoxide		R	R	R	Cyclohexanol		R to C	C to N	N
Carbon tetrachloride		C to N	N	N	Cyclohexanone		R to C	R to C	C to N
Carnauba wax		R	—	R	Decalin	pure	R	—	R
Casein		R	C	—	Detergents		R	R	R
Castor oil		R	C	R to C	Developer solutions (photographic)	RD	R	RD	
Caustic potash (dry & solution)		R	R	R	Dextrin		R	R	R
Caustic soda (dry & solution)		R	R	R	Dextrose		R	R	R
Cellosolve		C	C	—	Diazo salts		R	C	R
Cetyl alcohol (hexadecanol)		R	—	R	1,2-dibromoethane		C	—	N
Cellosolve acetate		C	C	—	Diethyl ether	pure	R to C	C	N
Chloral hydrate (aqueous)	all	R	R	RD	Diethyl phthalate	pure	R	C	C
Chloramine		R	—	—	Diethyl acetate		R	C	C
Chloroacetic acid		R to C	R to N	R to N	Dichloroacetic acid	pure	R	R	CD
Chloric acid	20%	R	N	—	Dichloroacetic acid	50%	R	—	CD
Chlorine, gaseous, dry		C to N	N	N	Dichloroacetic acid methyl ester		R	—	R
Chlorine, gaseous, moist		C to N	N	N	Dichlorobenzene		C	C to N	N
Chlorine, liquid		N	N	N	Dichlormethane		C	—	C
Chlorine, water		R to C	C	C to N	DDT (powder)		R	—	R
Chlorobenzene		C to N	C to N	N	Dichloroethylene		C to N	C to N	N
Chlorocarbonic acid		R	—	C	Dichloropropane		C	—	N
Chlorobenzyl chloride		C	C	C	Dichloropropene		C	—	N
Chloroethanol	pure	R	—	RD	Diesel fuel		R	C	C
Chloroform	pure	C to N	C to N	N	Diethyl amine		C	C	—
Chloromethane	100%	C	—	N	Diethylene glycol		R	R	R
Chloropicrin		R to C	—	N	Diethyl ether		R to C	C	C to N
Chlorosulphonic acid	100%	C to N	C to N	N	Di(2-ethylhexyl) phthalate (DOP)		R	—	C
Chrome alum		R	R	R	Diethyl ketone		R	—	C
Chrome anode mud		R	—	R	Diglycolic acid (aqueous)	30%	R	R	R
Chrome salts (aqueous)	all	R	—	R	Diisobutyl ketone	pure	R	R	C to N
Chromic acid	10%,30%,40%,50%	R	R to C	C to N	Diisopropyl ether		R to C	—	N
Chromic acid	80%	R	R to C	N	Dimethylamine		R to C	C	C
Chromium trioxide (aqueous*) up to 50%		R	—	—	Dimethyl formamide	pure	R	R	R to C
Chromosulphuric acid		R	C	N	Dimethyl sulphoxide		R	—	R
Cider		R	—	R	Diocetyl phthalate		R to C	C	C to N
Citric acid (aqueous)	saturated	R	R	R	Dioxane 1,4		R	R	R
Clophen® A50 & A60		R	—	C to N	Diphenylamine		R	—	C
Coal-tar oil		RD	—	CD	Diphenyl oxide		R	—	C
Coconut oil		R	R to C	R to C	Disodium phosphate		R	R	R
Cod liver oil		R	—	R to C	Disodium sulphate		R	—	R
Coke oven gas (benzene free)		R	R	R	Dodecylbzenesulphonic acid		R	—	C
Coffee extract		R	—	R	Drinking water		R	—	R
Cognac		R	—	—	Dyes		RD	—	RD
Cola concentrate		R	—	R	Electrolyte baths		R to C	—	C
Copper salts (aqueous)		R	R	R	Emulsifiers		R	—	R
Copper chloride (aqueous)		R	R	R	Emulsions (photographic)		R	—	R
Copper cyanide		R	—	R	Emulsions (acrylic)		R	—	R
Copper flouride (aqueous)		R	R	R	Ephedin (aqueous)	10%	R	—	R
Copper nitrate (aqueous)		R	R	R	Epichlorohydrin		R	—	R
Copper sulphate (aqueous)	all	R	—	R	Epsom salts	all	R	—	R
Corn oil		R	R to C	C	Esters, aliphatic	pure	R	R	R to C
Corn syrup		R	R	R	Ethane		R	—	R
Cranberry sauce		R	—	R	Ether		R to C	C	C
Coumarone resins		R	—	R	Ethyl acetate	pure	R	C	C to R
Creosote		R	R	RD	Ethylbenzene	pure	C	—	—
Cottonseed oil		R	C	R					
Cresol	100% diluted	R to C	R to N	CD					
Cresol (aqueous)		R	—	RD					

Chemical Resistance of HDPE Pipe Resins, continued

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Ethyl chloride	pure	C	—	N	Hexanetriol	R	—	R	
Ethyl ether		R to C	—	C to N	Hexanol	R	R	R	
Ethylene		R	—	C	Honey	R	—	R	
Ethyl esters		R	C	—	Hydraulic fluid	R	—	C	
Ethyl halides		R	C	—	Hydrazine hydrate	R	—	R	
Ethylene diamine	pure	R	—	R	Hydrobromic acid (aqueous) up to 50%	R	R	R	
Ethylene diamine-tetraacetic acid		R	—	R	Hydrobromic acid (aqueous) 100%	R	—	R	
Ethylene dichloride		C to N	N	N	Hydrochloric acid up to 100%	R	R	R	
Ethylene chloride		C	—	C	Hydrogen chloride gas wet & dry	R	—	R	
Ethyl dibromide		C	—	N	Hydrocyanic acid	10%	R	R	R
Ethylene glycol		R	R	R	Hydrofluoric acid	40%	R	R	C
Ethylene oxide (gas)		R to C	C	R	Hydrofluosilicic acid (aqueous) all	R	—	R	
2-Ethylhexanol		R	—	C	Hydrogen	100%	R	R	R
Euron® B		C	—	C	Hydrogen peroxide (aqueous) 10%	R	—	R	
Euron® C		R	—	R	Hydrogen peroxide (aqueous) 30%	R	R	R	
Fatty acids amides		R	—	C	Hydrogen peroxide (aqueous) 50%	R	—	R	
Fatty acids		R	R	R to C	Hydrogen peroxide (aqueous) 90%	R	N	N	
Fatty alcohols		R	—	C	Hydrogen phosphide	R	—	R	
Ferric chloride (aqueous)	all	R	R	R	Hydrogen sulphide	dry	R	R	R
Ferric and ferrous salts (aqueous)		R	R	R	Hydroquinone	RD	D	RD	
Fertilizer salts (aqueous)	all	R	—	R	Hydrosulphite up to 10%	R	—	R	
Film solutions		R	R	R	Hydroxylamine sulphate (aqueous) 12%	R	R	R	
Fir wood oil		R	—	C	Hypochlorus acid	R	R	R to C	
Fish solubles		R	—	R	Ink	R	—	R	
Fluoboric acid		R	R	R to C	Iodine - in KI 3% (aqueous)	R	R	R	
Fluorine, dry gas		C to N	N	N	Iodine alcohol solution	C	C to N	N	
Fluorine, wet gas		N	N	N	Iodine (aqueous) 10%	C	C	—	
Fluorosilicic acid	30%-40%	R	R	R	Iron III chloride (aqueous) all	R	—	R	
Formaldehyde	to 40%	R	R	R	Isobutyl alcohol	R	—	R	
Formamide		R	—	R	Isooctane	R to C	C	C	
Formic acid (aqueous)	10%-50%	R	R to M	R	Isopropanol	R	C	R to N	
Formic acid (aqueous)	85%-100%	R	—	R	Isopropyl acetate	pure	R	—	C
Freon - F11, 12, 113, 114		R to C	C	C to N	Isopropyl ether	pure	R to C	C	N
Freon - 21, F22		C	C	—	Jam, jellies	R	—	R	
Fruit juices & pulp & fructose	all	R	R	R	Jet fuels, JP-4 & JP-5	R	C	—	
Fuel oil		R	C	C	Kerosene	C	C to N	C to N	
Furfural		C	C to N	C to N	Ketones	R to C	C	C to N	
Furfuryl alcohol		R	—	R to C	Kraft paper liquor	R	R	—	
Gallic acid		R	—	—	Labarraque's solution	R to C	—		
Gas, coal, manufactured		R	R	R	Lactic acid	10%-96%	R	R	R
Gas, natural, methane		R	R	—	Lactose	R	—	R	
Gasoline		R to C	C to N	C to N	Lacquer thinners	C	C	—	
Gelatin		R	R	R	Lanolin (wool fat)	R	—	R	
Genantin®		R	—	R	Lard oil	R	R	—	
Glucose		R	R	R	Latex	R	—	R	
Glue		R	R	R	Lauric acid	R	R	—	
Glycerine (glycerol)(aqueous) to 100%		R	R	R	Lauryl chloride	R	R	—	
Glycerol chlorhydrin		R	—	R	Lauryl sulphate	R	R	—	
Glycine		R	—	R	Lead acetate (aqueous) all	R	R	R	
Glycol		R	R	R	Lead salts	R	R	—	
Glycolic acid (aqueous)	up to 70%	R	R	R	Lead tetraethyl	R	R	—	
Glycolic acid butyl ester		R	—	R	Lime	R	—	R	
Glysentin		R	—	R	Lime sulphur	R	R	—	
Grisiron 8302		C	—	C	Lime water	R	—	R	
Grisiron 8702		R	—	R	Linseed oil	R to C	C	R to N	
Halothane		C	—	C to N	Liquor	R	R	R	
Heptane		R	C	C to N	Liqueur	R to C	R	N	
Heating oil		C	C	—					
Hexane		R	C	C					



Chemical Resistance of HDPE Pipe Resins, continued

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Liquid manure		R	—	R	Molasses		R	R	R
Liquid paraffin		R	—	R	Mixed acids (sulfuric & nitric)		N	N	—
Liquid soaps		R	—	R	Mixed acids (sulfuric & phosphoric)		R	C	—
Lithium bromide		R	—	R	Monochloroacetic acid		R	—	R
Lubricating oils	R to C	C	C		Monochloroacetic acid ethyl ester		R	—	R
Lithium salts	R	R	—		Monochloroacetic acid methyl ester		R	—	R
Linoleic acid	R	R	—		Monochlorobenzene		C to N	C to N	N
Lysol	R	—	C		Monooctanolamine		—	—	—
Machine oil		R	R	C	Morpholine		R	—	R
Magnesium salts		R	R	R	Motor oil		R	R	R to C
Magnesium carbonate		R	R	R	Mowilith® polymer emulsions		R	—	R
Magnesium chloride		R	R	R	Mustard		R	—	R
Magnesium fluosilicate		R	—	R	Nail varnish remover		R	—	C
Magnesium hydroxide		R	—	R	Naphtha		R to C	C to N	C to N
Magnesium iodide		R	—	R	Naphthalene		R	C	C
Magnesium sulphate		R	R	R	Nickel chloride		R	R	R
Magnesium hydroxide		R	R	R	Nickel nitrate		R	R	R
Magnesium nitrate		R	R	R	Nickel salts		R	R	R
Maleic acid	50%-100%	R	R	R	Nickel sulphate (aqueous)	all	R	—	R
Malic acid	50%	R	R	R	Nicotine		R	—	R
Manganese sulphate		R to C	R to C	R	Nicotine acid	diluted solution	R	—	R
Margarine		R	—	R	Nitric acid	0-30%	R	R to C	R
Mash		R	—	R	Nitric acid	30-50%	R to C	C	N
Mayonnaise		R	—	—	Nitric acid	60%	C	N	N
Menthol		R	R	C	Nitric acid	70%	C to N	N	N
Mercuric chloride		R	R	R	Nitric acid	80%	N	N	N
Mercuric cyanide		R	R	R	Nitric acid	90%	N	N	N
Mercurous nitrate		R	R	R	Nitric acid	100%	N	N	N
Mercuric salts		R	R	R	Nitric acid fuming		N	N	N
Mercury		R	R	R	Nitrobenzene		R to C	C	N
Metallic soaps		R	R	R	Nitrocellulose		R	—	—
Metallic mordants		R	—	—	Nitrotoluene		R	C	N
Methacrylate		R	—	R	Nitrous acid		R	N	—
Methacrylic acid		R	—	R	Nitrous oxide, gas		R	N	—
Methane		R	R	—	Nitroglycerine		R	C	—
Methanol	pure	R	R	R	Nitroglycol		—	—	—
Methyl acetate		C	C	—	Nitropropane		—	—	—
Methyl bromide		C	C to N	N	Nonyl alcohol		R	—	R
Methyl cellosolve		C	C	—	Octyl cresol		C	N	—
Methyl chloride		C	C to N	N	Oils and fats		R	R to C	C to N
Methyl chloroform		C	C	—	Oils, vegetable		R to C	C	C
Methyl benzene		C	—	N	Oleic acid		R to C	C	C
Methoxy butanol		R	—	C	Oleum		N	N	N
Methoxybutyl acetate (Butozyl)		R	—	C	Olive oil		R	R	R
Methyl cyclohexane		C	C	N	Optical brighteners		R	—	R
Methyl cyclohexanone		R	C	—	Orange juice		R	—	R
Methyl methacrylate		R	C	R	Orthophosphoric acid	50%	R	R	R
Methyl salicylate		R	—	C	Orthophosphoric acid	85%	R	R	C
Methyl sulfate	50%	R	—	R	Oxalic acid		R	R	R
Methyl sulfuric acid		R	—	R	Oxygen, gas		R	R	R
Methyl ethyl ketone		R to N	R	N	Ozone, gas		C	C	N
Methyl glycol		R	—	R	Palmatic acid	10%	R	R	R to C
Methyl isobutyl ketone		R	—	C to N	Palmitic acid	70%	R	R	—
4-Methyl2-pentanone		R	—	R to CD	Palmityl alcohol		R	—	R
Methyl propyl ketone		R	—	C	Pareaffin		R to C	C	C
n-Methyl pyrrolidone		R	—	R	Palm kernel oil		R	—	R
Methylene bromide		C	C	—	Paraformaldehyde		R	—	R
Methylene chloride*		C	C	C to N	Pentane		C	C	—
Methylene iodide		C	C	—	Pentanol		R	—	R
Milk		R	R	R					
Mineral oil		R to C	C	C to N					

Chemical Resistance of HDPE Pipe Resins, continued

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Peppermint oil		R	—	—	Potassium nitrate		R	R	R
Peracetic acid		R	—	—	Potassium orthophosphate	saturated	R	—	R
Perchloric acid (aqueous)	up to 20%	R	R	R	Potassium perchlorate		R	R	R
Perchloric acid (aqueous)	20% to 50%	R	R	C	Potassium perborate		R	R	R
Perchloric acid (aqueous)	70%	R	R to C	N	Potassium permanganate	up to 25%	R	R	R
Perchloroethylene		C	C	N	Potassium persulphate (aqueous)	all	R	R	R
Perfume oils		C	—	C to N	Potassium salts		R	R	—
Petroleum (sour, refined)		R	C	C	Potassium sulphate		R	R	R
Petroleum ether		R	—	C	Potassium sulfide		R	R	R
Phenol		R	C	RD	Potassium sulfate		R	—	R
Phenolic resin molding materials		R	—	R	Potassium tetracyanocuprate		R	—	R
Phenylcarbinol		—	—	—	Potassium thiosulphate		R	—	R
Phenyethylalcohol		R	—	R	Propane, gas		R	R	R
Phenyldiazine		C	C	C to N	Propargyl alcohol (aqueous)	7%	R	—	R
Phenyldiazine hydrochloride		R to C	C	R	Propionic acid (aqueous)	all	R	—	R to C
Phenylsulphonate		R	—	R	Propylene dichloride	100%	C to N	—	N
Phenylsulphonate		R	—	R	Propylene glycol		R	R	R
Phosgene gas	C to N	C	—	—	Propylene oxide		R	—	R
Phosgene liquid	N	N	—	—	Prussic acid		R	R	R
Phosphorus oxychloride		R	R	C	Pseudocumene		C	—	C
Phosphorus pentoxide		R	R	R	Pyridine		R	C	C
Phosphorus trichloride		R	R	C	Pyrogallic acid		—	—	—
Phosphoric acid	50%	R	R	R	Pulp mill water (red & black liquor)		R	R	—
Phosphoric acid	80%-100%	R	—	CD	Quinine		R	—	R
Phosphorus, yellow		—	—	—	Quinol (hydroquinone)		R	—	R
Phosphorus, red		—	—	—	Rayon coagulating bath		R	—	R
Phosphates (aqueous)	all	R	R	R	Rubber dispersions (latexes)		R	—	R
Photographic developers		RD	—	RD	Sargotan®		R	—	C
Phthalic acid (aqueous)	50%	R	R	R	Salinec acid (aqueous)		R	—	C
Phthalic acid ester		R	—	R to C	Salicylic acid		R	R	R
Picric acid (aqueous)		R	R to C	C	Saturated steam concentrate		R	—	R
Pineapple juice		R	—	R	Sauerkraut		R	—	R
Pine-needle oil		R	—	C	Salicylaldehyde		R	R	—
Plating solution, metals (many types)		R	C	R	Sea water		R	R	R
Plasticizers		R	—	C	Selenic acid		R	R	R
Polyester plasticizers		R	—	R to C	Sewage, residential		R	R	—
Polyester resins		C	—	R	Silicic acid (aqueous)	all	R	R	C
Polyglycols		R	—	R	Silicone, oil		R	R to C	R to C
Potash		R	R	R	Silver, acetate		R	R	R
Potash aluminum (aqueous)		R	—	R	Silver, cyanide		R	R	R
Potassium alkyl xanthates		—	—	—	Silver, nitrate		R	R	R
Potassium bicarbonate (aqueous)	all	R	—	R	Silver salts		R	R	R
Potassium bichromate	40%	R	—	R	Soap solutions (can be stress cracking agents)		R	R	R
Potassium bisulphate (aqueous)	all	R	—	R	Sodium acetate (aqueous)	all	R	R	R
Potassium borate (aqueous)	1%	R	R	R	Sodium aluminum phosphate		R	—	R
Potassium bromate (aqueous)	up to 10%	R	R	R	Sodium benzoate		R	R	R
Potassium bromide (aqueous)	all	R	R	R	Sodium bicarbonate		R	R	R
Potassium carbonate (aqueous)	all	R	R	R	Sodium bisulphite		R	R	R
Potassium chlorate (aqueous)	all	R	R	R	Sodium bisulphite (aqueous)	all	R	R	R
Potassium chloride (aqueous)	all	R	R	R	Sodium borate		R	R	R
Potassium chromate (aqueous)	40%	R	R	R	Sodium bromide		R	R	R
Potassium cyanide (aqueous)	all	R	R	R	Sodium carbonate (aqueous)	all	R	R	R
Potassium dichromate (aqueous)	all	R	R	R	Sodium chlorate	saturated	R	R	R
Potassium ferricyanide (aqueous)	all	R	R	R	Sodium chloride (aqueous)	salt	R	R	R
Potassium ferrocyanide (aqueous)	all	R	R	R	Sodium chloride		R	R	R
Potassium fluoride (aqueous)	all	R	R	R	Sodium chromate		R	—	R
Potassium hydroxide (aqueous)	all	R	R	R	Sodium cyanide		R	R	R
Potassium hypochlorite		R	R	C	Sodium dichromate		R	—	R
Potassium hydrogen carbonate		R	—	R	Sodium dichromate, acid		R	C	—
Potassium hydrogen sulfate	saturated	R	—	R					
Potassium hydrogen sulfide		R	—	R					
Potassium iodide		R	—	R					



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Chemical Resistance of HDPE Pipe Resins, continued

Chemical Name	Concentration	73°F	120°F	140°F	Chemical Name	Concentration	73°F	120°F	140°F
Sodium dodecybenzenesulfonate		R	—	R	Tetrahydronaphthalene		R	—	C to N
Sodium ferricyanide		R	R	R	Thioglycolic acid		R	—	R
Sodium ferrocyanide		R	R	R	Thionyl chloride		N	N	N
Sodium fluoride		R	R	R	Thiophene		C	—	N
Sodium hexacyanoferrate		R	—	R	Thread cutting oil		—	—	—
Sodium hydrogen carbonate		R	—	R	Terpineol		—	—	—
Sodium hydrogen phosphate		R	—	R	Titanium tetrachloride		R	R	—
Sodium hydrogen sulfite		R	—	R	Toluene	25%-75%	C to N	C to N	N
Sodium hydroxide, aqueous & solid	all	R	R	R	Toluene - kerosene		C	—	N
Sodium hypochlorite		R	R	R	Transformer oil		R	R to C	R to C
Sodium nitrate (aqueous)	all	R	R	R	Tributyl citrate		C	C	—
Sodium orthophosphate		R	—	R	Triethyl phosphate		R to C	N	R
Sodium perborate (aqueous)	all	R	—	R	Trichloroacetic acid	pure	R	R	C to N
Sodium perchlorate (aqueous)	R	R	—	R	Trichloroethylene	50%	R	C	R
Sodium peroxide	10%	R	—	R	Trichlorobenzene	pure	C to N	C to N	N
Sodium peroxide (aqueous)	saturated	C	—	—	Tricresyl phosphate		R to C	C	R
Sodium phosphate (aqueous)	saturated	R	—	R	Triethanolamine		R	C	R to CD
Sodium salts (aqueous)		R	R	—	Triethylene glycol		R	—	R
Sodium silicate		R	—	R	Triethylamine		R	C	—
Sodium sulphate		R	R	R	Triethyl borate		R	—	C to N
Sodium sulfide		R	R	R	Trimethyl propane		C	C	—
Sodium sulfite		R	—	R	Trimethyl propane (aqueous)		R	—	R
Sodium thiosulphate		R	R	R	Tri-B-chloroethyl phosphate		R	—	R
Soft soap		R	—	R	Trioctyl phosphate		R	—	C
Soybean oil		R	—	R	Trisodium phosphate		R	—	R
Spindle oil		R to C	—	C	Turpentine		C	C to N	N
Stain removers		R to C	—	C	Tutogen® U		R	—	R
Stannic chlorides		R	R	R	Tween® 20 & 80		R	—	N
Stannous chloride		R	R	R	Two-stroke engine oil		R	—	C
Starch (aqueous)	up to 100%	R	R	R	Urea	up to 33%	R	R	R
Stearic acid		R	R	R to C	Uric acid		R	—	R
Styrene		C	—	N	Urine		R	R	R
Stoddard solvent		R	C	—	Vaseline		R to C	R	C
Succinic acid	50%	R	—	R	Vegetable oils		R	R	R
Sulfur dioxide, dry		R	R	R	Vinegar		R	R	R
Sulfur dioxide, wet		R	R	R to C	Vinyl acetate		R	—	R
Sulfite liquor		R	R	—	Walnut oil		R	—	C
Sulfur		R	R	R	Water, distilled, fresh, mine, salt, tap		R	R	R
Sulfuric acid	up to 50%	R	R	R	Wax alcohols		C	—	C
Sulfuric acid	50%-70%	R	R	R	Waxes		R	—	R to C
Sulfuric acid	70%-90%	R	C to N	C	Whey		R	—	R
Sulfuric acid	90%	C to N	N	N	Whiskey		R	R	R
Sulfuric acid fuming		N	N	N	Wine		R	R	R
Sulfuric acid		R	R	R	Wood stains		R	—	R to C
Sulfuric ether		R to C	—	C	Xylene		C to N	C to N	N
Sulfur trioxide		N	N	N	Yeast		R	R	R
Sulfuryl chloride		N	—	—	Zinc carbonate		R	R	R
Syrups & sugars		R	R	R	Zinc chloride		R	—	R
Tall oil		R	R	—	Zinc oxide		R	—	R
Tallow	pure	R	R	R	Zinc salts (aqueous)	all	R	R	R
Tannic acid		R	R	R	Zinc sulfate		R	—	R
Tanning liquors		R	R	—	Zinc sludge		R	—	R
Tartaric acid (aqueous)		R	R	R	Zinc stearate		R	—	R
Tetrabromoethane		N	N	N			R	—	R
Tetrachloroethene		C to N	C to N	N			R	—	R
Tetrachloromethylene		—	—	—			R	—	R
Tetraethyl lead		—	—	—			R	—	R
Tetrahydrofuran		C to N	N	N			R	—	R

References

1. AGA Plastic Pipe Manual for Gas Service . (1985). Catalog No. XR065. American Gas Association, Arlington, VA, 1985.
2. ASTM Annual Book , Volume 08.01 Plastics (I): C177 - D1600, American Society for Testing and Materials, Philadelphia, PA.
3. ASTM Annual Book , Volume 08.02 Plastics (II): D1601 - D3099, American Society for Testing and Materials, Philadelphia, PA.
4. ASTM Annual Book , Volume 08.03 Plastics (III): D3100 - Latest, American Society for Testing and Materials, Philadelphia, PA.
5. ASTM Annual Book , Volume 08.04, Plastic Pipe and Building Products, American Society for Testing and Materials, Philadelphia, PA.
6. ASTM Annual Book , Volume 03.01, Metals - Mechanical Testing; Elevated and Low-Temperature Tests; Metallography, American Society for Testing and Materials, Philadelphia, PA.
7. ASTM Annual Book , Volume 05.01, Petroleum Products and Lubricants (I), D56 - D1947, American Society for Testing and Materials, Philadelphia, PA.
8. Ayres, R. L. (1981, May 18-20). Basics of Polyethylene Manufacture, Structure, and Properties, American Gas Association Distribution Conference, Anaheim, CA.
9. Barker, M. B., J. Bowman, & M. Bevis (1983). The Performance and Causes of Failure of Polyethylene Pipes Subjected to Constant and Fluctuating Internal Pressure Headings, Journal of Materials Science , 18, 1095-1118.
10. Barker, M. B., & J. Bowman. (1986, December). A Methodology for Describing Creep-Fatigue Interactions in Thermoplastic Components, Polymer Engineering and Science , Vol. 26, No. 22, 1582-1590.
11. Bowman, J. (1989). Can Dynamic Fatigue Loading be a Valuable Tool to Assess MDPE Pipe System Quality, Proceedings of the 11th Plastic Fuel Gas Pipe Symposium, 235-248.
12. Broutman, L. J., D. E. Duvall, & P. K. So. (1990). Application of Crack Initiation and Growth Data to Plastic Pipe Failure Analysis, Proceedings of the Society of Plastics Engineers 48th Annual Technical Conference, Vol. 36, 1495-1497.
13. Designing with Plastic - The Fundamentals . (1989). Hoechst Celanese Corporation, Engineering Plastics Division Chatham, NJ.
14. Diedrich, G., B. Kempe, & K. Graf. (1979). Zeilstandfestigkeit von Rohren aus Polyethylen hart (HDPE) und Polypropylene (PP) unter Chemikalienwirkung (Creep Rupture Strength of Polyethylene (HDPE) and Polypropylene (PP) Pipes in the Presence of Chemicals), Kunstoffe 69, 470-476.
15. Dieter, G. E. (1966). Mechanical Metallurgy , 3rd Edition, McGraw-Hill Book Company, New York, NY.
16. Driscopipe Engineering Characteristics . (1981). Phillips Driscopipe, Inc., Richardson, TX.
17. Gaechter, R., & H. Mueller (ed.). (1963). Plastics Additives , Hanser Publications, New York, NY.
18. Griffith, A. A. Phil. Trans. (1920). Royal Society of London, Vol. A 221, p. 163.
19. Haag, J., Griffith. (1989, January). Measuring Viscoelastic Behavior, American Laboratory , No. 1, 48-58.
20. Harper, C. A. (ed.). (1975). Handbook of Plastics and Elastomers , McGraw-Hill Book Company, New York, NY.
21. Heger, F., R. Chambers, & A. Deitz. (1982). Structural Plastics Design Manual , American Society of Civil Engineers, New York, NY.
22. Hertzberg, R. W. (1983). Deformation and Fracture Mechanics of Engineering Materials , 2nd Edition, J. Wiley & Sons, New York, NY.
23. Hoechst Plastics. (1981). Hostalen , Brochure No. HKR IOle-8081, Hoechst AG, Frankfort, Germany.
24. Hoechst Plastics. (1982). Pipes , Brochure No. HKR 111e-8122, Hoechst AG, Frankfort, Germany.
25. Hoff, A., & S. Jacobsson. (1981). Thermo-Oxidative Degradation of Low-Density Polyethylene Close to Industrial Processing Conditions, Journal of Applied Polymer Science , Vol. 26, 3409-3423.
26. Kemp, G. (1984). Pruefmethoden zur Ermittlung des Verhaltens von Polyolefinen bei der Einwirkung von Chemikalien (Methods to Determine the Behavior of Polyolefins in Contact with Chemicals), Zeitschrift fuer Werkstofftech , 15, 157-172.
27. Krishnaswamy, P., et al. (1986). A Design Procedure and Test Method to Prevent Rapid Crack Propagation in Polyethylene Gas Pipe, Battelle Columbus Report to the Gas Research Institute.
28. Levenspiel, O. (1982). Chemical Reaction Engineering , John Wiley & Sons, New York, NY.
29. Mruk, S. A. (1985). Validating the Hydrostatic Design Basis of PE Piping Materials, Proceedings of the Ninth Plastics Fuel Gas Pipe Symposium, 202-214.
30. NSF Standard 61: Drinking Water System Components - Health Effects , National Sanitation Foundation, Ann Arbor, MI.
31. O'Donoghue, P. E., et al. (1989). A Fracture Mechanic's Assessment of the Battelle Slow Crack Growth Test for Polyethylene Pipe Materials, Proceedings of the 11th Plastics Fuel Gas Pipe Symposium, 364-376.
32. Palermo, E. F. (1983). Rate Process Method as a Practical Approach to a Quality Control Method for Polyethylene Pipe, Proceedings of the Eighth Plastics Fuel Gas Pipe Symposium.
33. Palermo, E. F., & I. K. DeBlieu. (1985). Rate Process Concepts Applied to Hydrostatically Rating Polyethylene Pipe, Proceedings of the Ninth Plastics Fuel Gas Pipe Symposium.
34. Plastics Pipe Institute. (1990). Technical Note 11, Suggested Temperature Limits for Thermoplastic Pipe Installation and for Non-Pressure Pipe Operation, Washington, DC.
35. Plastics Pipe Institute. (1992). Technical Report TR-3, Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials, Washington, DC.
36. Plastics Pipe Institute. (1992). Technical Report TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting Compounds, Washington, DC.

37. Plastics Pipe Institute. (1989). Technical Report TR-11, Resistance of Thermoplastic Piping Materials to Micro- and Macro-Biological Attack, Washington, DC.
- 37a. Plastics Pipe Institute. (1973). Technical Report TR-18, Weatherability of Thermoplastic Piping, Washington, DC.
38. Plastics Pipe Institute. (1991). Technical Report TR-19, Thermoplastic Piping for the Transport of Chemicals, Washington, DC.
39. Plastics Pipe Institute. (1990). Statement N, Pipe Permeation, Washington, DC.
40. Powell, P.C. (1983). Engineering with Polymers , Chapman and Hall, New York, NY.
41. Richards, D., Abrasion Resistance of Polyethylene Dredge Pipe , US Army Engineer Waterways Experiment Station, Hydraulics Laboratory, Vicksburg, MS.
42. Rodriguez, F. (1970). Principles of Polymer Systems , McGraw-Hill Book Company, New York, NY.
43. Rooke, D. P., & D. J. Cartwright. (1974). Compendium of Stress Intensity Factors , Her Majesty's Stationery Office, London.
44. Sih, G. C. (1973). Handbook of Stress Intensity Factors for Researchers and Engineers , Lehigh University, Bethlehem, PA.
45. So, P. K., et al. (1987). Crack Initiation Studies in PE Pipe Grade Resins, Proceedings of the 10th Plastics Fuel Gas Pipe Symposium, 240-254.
46. Van Vlack, L. H. (1975). Elements of Material Science and Engineering , Addison-Wesley Publishing Co., Inc.
47. The Vinyl Institute. (1987). Combustion Gases of Various Building Materials , Wayne, NJ.
48. The Vinyl Institute. (1986). Combustion Toxicity Testing , Wayne, NJ.
49. Plastics Pipe Institute. (1992). Technical Note TN-16, Rate Process Method for Evaluating Performance of Polyethylene Pipe, Washington, DC.