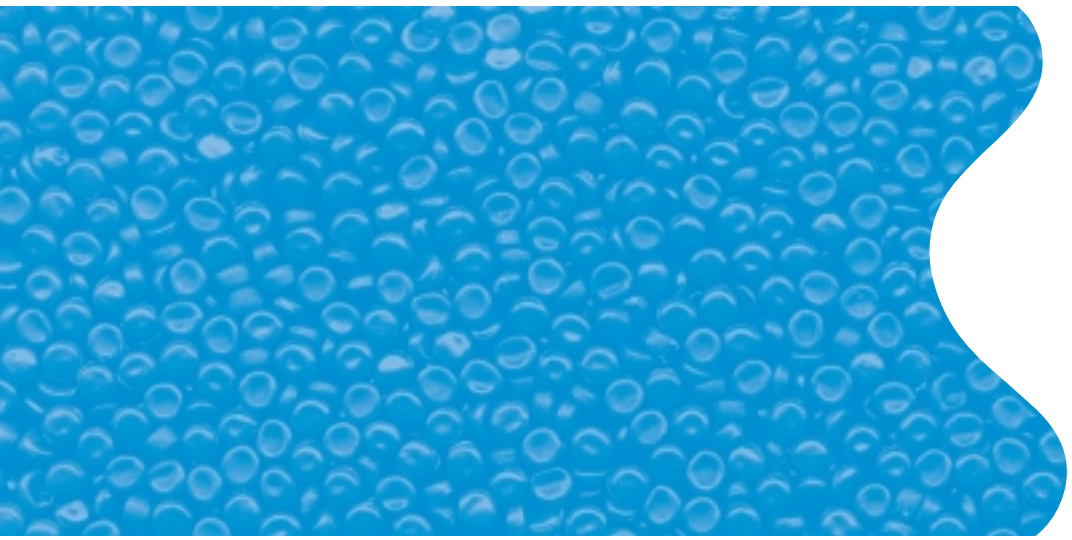
English



Polyethylene

Resistance to chemicals and other media

Lupolen (LDPE, HDPE)
Hostalen (HDPE)
Lupolex (LLDPE)
Luflexen (mLLDPE)

basell
Polyolefins

Formed in October 2000, Basell is owned equally by BASF and Shell. Basell and its joint ventures serve customers in more than 120 countries with materials produced in 18 countries. The company's network of joint ventures expands Basell's technology and market base and enables the company to follow key customers as they expand and globalize their operations.

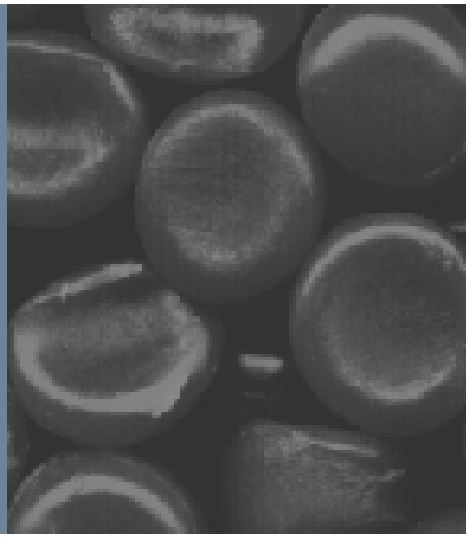
With research and development centers in Europe, North America and the Asia-Pacific region, Basell is continuing and expanding a technological heritage that dates back to the start of the polyolefins industry. The company is committed to continuously extending the property profile of its polyolefins portfolio and to developing with its customers a shared agenda for bringing new products to market as quickly as possible.

Basell is committed to strong Health, Safety and Environmental (HSE) performance. The company's products are used in countless consumer and industrial goods from food and drink packaging to car components, and from household products to underground piping.

Basell's corporate center is located in Hoofddorp, The Netherlands, near Amsterdam. The company has regional offices in Brussels, Belgium; Mainz, Germany; Elkton, Maryland, USA; São Paulo, Brazil; and Hong Kong, as well as sales offices in the major markets around the world.

About Basell

Basell develops, produces and markets polypropylene, polyethylene, advanced polyolefin materials and polyolefin catalysts and also develops and licenses polyolefin processes.



The Resistance to Chemicals

Lupolen, Lupolex, Luflexen and *Hostalen* resins are highly resistant to chemicals due to their hydrocarbon character and degree of crystallinity.

The proportion of crystalline matter in a linear, high-density polyethylene is about 70 to 80 %; in branched polyethylene of low to medium density, 40 to 45 %. The resistance to chemicals is thus reduced in this sequence. The adverse action of chemicals may consist of diffusion through the polyethylene articles, swelling or dissolving, or direct attack, e. g. by oxidation.

Polyethylene is not absolutely impermeable to gases. In fact some liquids, particularly aromatic, aliphatic, and low-boiling chlorinated hydrocarbons, e. g. benzene and carbon tetrachloride, may diffuse through polyethylene even at low temperatures. The higher the temperature and the lower the degree of crystallinity, the greater the diffusion rate.

Lupolen, Lupolex, Luflexen and *Hostalen* resins are completely resistant at room temperature to water, alkalis, solutions of salts, and inorganic acids[1)] (with the exception of those acids that are oxidizing agents). At low temperatures polar liquids, such as alcohols, organic acids, esters, ketones, etc. will generate a very slight swelling of the resins. In contrast aliphatic and aromatic hydrocarbons and their halogen derivatives are taken up more readily and cause considerable swelling.

Swelling is associated with a decrease in strength, but the original properties are restored upon evaporation of the liquid concerned. This is not the case with low-volatile substances, e. g., greases, oils, waxes, etc. Swelling and the related impairment of properties decreases with decreasing temperatures and with increases in crystallinity of the polyethylene.

At elevated temperatures, *Lupolen, Lupolex, Luflexen* and *Hostalen* resins are soluble in aliphatic, aromatic and chlorinated hydrocarbons to an extent depending on their density. The temperature at which these materials are dissolved increases with the degree of crystallinity. For instance, *Lupolen* resins with a density of 0.960 g/cm³ swell only slightly in benzene at the boiling point, whereas *Lupolen* resins with a density of 0.918 g/cm³ dissolve completely.

Despite their good resistance to chemicals, polyethylene mouldings are sometimes subject to environmental stress cracking if they are exposed to the simultaneous action of certain polar liquids and mechanical stresses, particularly tension or bending.

Notorious initiators of environmental stress cracking are silicone and essential oils, alcohols, organic acid, and aqueous solutions of surfactants, e. g., modern detergents, soaps, emulsifying agents etc. aqueous solutions of alkalis, e. g., caustic soda, soda or waterglass, may also give rise to environmental stress cracking, but not to a great extent.

Even if no external load is applied, high moulded-in stresses could favour environmental stress cracking if a moulded part gets in contact with any of the reagents mentioned above. Polyethylene with a low melt index is more resistant to environmental stress cracking.
The resistance to chemicals of *Lupolen, Lupolex, Luflexen* and *Hostalen* resins is included in the attached tables. For the sake of convenience, all the products have been classified into two groups, viz.,

LDPE, LLDPE, mLLDPE
($\rho = 0.918 - 0.935$ g/cm³)

MDPE, HDPE
($\rho = 0.935 - 0.960$ g/cm³)

The results of such chemical resistance tests are often subject to external influences that are difficult to define. For instance, a polyethylene may be listed as resistant to some substances, but may be damaged if it is immersed in each one of them, one after the other. In addition, the temperature, mechanical load, duration of exposure and permissible tolerances can vary considerably in practice. In such cases, Basell should be contacted or practical tests should be conducted.

The purpose of the resistance tables is to give a preliminary idea on the performance of a given moulding or to facilitate selection of suitable grades.

This does not preclude the need to check the chemical resistance of the particular finished article under the specific service conditions as part of overall design testing, e. g. of drums for the transport of dangerous goods. The information listed is not necessarily valid for all applications.

Table

Plastic test specimens were immersed for 60 days in the test substance without mechanical stress and then tested for swelling, weight loss and tensile properties.

Test specimen:
50 mm x 25 mm x 1 mm and test specimen 1B according to ISO 527-2, with dimensions in the ratio 1:4, both taken from compression moulded sheet.

Explanation of symbols:

✣ = **resistant**
tensile strength at yield and elongation at break unchanged

○ = **limited resistance**
tensile strength at yield and elongation at break slightly reduced

▭ = **not resistant**
tensile strength at yield and elongation at break greatly reduced

▽ = **discolouration possible**

★ = **and at boiling point**

★★ = **not applicable to welded joints**
(including joints produced by thermal bending); information available from us or the semifinished product manufacturer

1) Strong acids can cause shade changes, particularly in coloured material

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Acetaldehyde	techn. grade	✣	○	✣	▭
Acetaldehyde, aqueous	any	✣	○	✣	
Acetaldehyde + acetic acid	90:10	✣		✣	
Acetamide		✣	✣	✣	
Acetic acid	100%	✣	○▽	✣	○▽
Acetic acid, aqueous	70%	✣	✣	✣	✣
Acetic anhydride	techn. grade	✣	○▽	✣	
Acetoacetic acid		✣		✣	
Acetone	techn. grade	✣	✣*	○	
Acetophenone		✣		○	
Acetylene		✣			
Acids, aromatic		✣	✣	✣	
Acronal® dispersions	as supplied commerc.	✣	○	✣	
Acrylonitrile	techn. grade	✣	✣	✣	○
Adipic acid, aqueous	saturated	✣	✣	✣	✣
Adipic ester		✣	○		
Air	techn. grade	✣	✣	✣	✣
Aktivin® (chloramine, aqueous 1%)		✣	✣	✣	✣
Allyl acetate		✣	✣ to ○	✣	○
Allyl alcohol (2-propenol-1)	96%	✣	✣	○	○
Allyl chloride		○	▭	▭	▭
Aluminium chloride, aqueous	any	✣	✣	✣	✣
Aluminium chloride, solid		✣	✣	✣	✣
Aluminium fluoride	conc.	✣	✣	✣	✣
Aluminium hyroxide		✣	✣	✣	✣
Aluminium metaphosphate		✣	✣	✣	✣
Aluminium sulphate, aqueous	saturated	✣	✣	✣	✣
Aluminium sulphate, solid		✣	✣	✣	✣
Alum, aqueous	any	✣	✣	✣	✣
Amino acids		✣	✣	✣	✣
2-aminoethanol (ethanolamine)	techn. grade	✣		✣	
Ammonia, gaseous		✣	✣	✣	
Ammonia, liquid		✣		✣	
Ammonia water	any	✣	✣	✣	
Ammonium acetate, aqueous	any	✣	✣	✣	✣
Ammonium bicarbonate, aqueous	saturated	✣	✣	✣	✣
Ammonium carbonate, aqueous	any	✣	✣	✣	✣
Ammonium chloride, aqueous	any	✣	✣	✣	✣
Ammonium fluoride, aqueous	saturated	✣	✣	✣	✣
Ammonium hydrosulphide, aqueous	any	✣	✣	✣	✣
Ammonium metaphosphate		✣	✣	✣	✣
Ammonium nitrate, aqueous	any	✣	✣	✣	✣
Ammonium phosphate, aqueous	any	✣	✣	✣	✣
Ammonium sulphate, aqueous	any	✣	✣	✣	✣

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Ammonium sulphide, aqueous	any	✣	✣	✣	✣
Ammonium thiocyanate		✣	✣	✣	✣
Amyl acetate	techn. grade	✣	✣	✣	○
Amyl alcohol (C5 alcohols)	techn. grade	✣	✣	✣	○
Amyl chloride	100%	○	▭	▭	▭
Amyl phthalate		✣	○	○	○
Aniline	any	✣	✣	✣	○
Aniline hydrochloride, aqueous	any	✣	✣	✣	✣
Animal oils		✣	○	✣	○
Aniseed		○	○ to ▭	▭	▭
Aniseed oil		○	▭	▭	▭
Anisole		✣	▭	○	▭
Anone (cyclohexanone)		✣	○	○	▭
Anthraquinone sulphonic acid, aqueous (susp.)		✣	✣	✣	✣
Antifreeze (automotive)	as supplied commerc.	✣	✣	✣	✣
Antimony chloride, anhydrous		✣	✣	✣	✣
Antimony pentachloride		✣	✣	✣	✣
Antimony trichloride		✣	✣	✣	✣
Aqua regia (HCl + HNO3)		▭		▭	
Aromatic oils		○	▭	○	▭
Arsenic acid, aqueous	any	✣	✣	✣	✣
Arsenic anhydride		✣	✣	✣	✣
Ascorbic acid		✣	✣	✣	✣
Asphalt		✣	○▽	✣	○▽
Aspirin®		✣		✣	
Barium hydroxide, aqueous	any	✣	✣	✣	✣
Barium salts, aqueous	any	✣	✣	✣	✣
Battery acid		✣	✣	✣	✣
Beater glue (animal glue)	as supplied commerc.	✣	✣		
Beef tallow		✣	✣ to ○	✣	○
Beer		✣	✣	✣	✣
Beer sugar colouring	as supplied commerc.	✣	✣	✣	✣
Beeswax		✣	○ to ▭	✣	▭
Benzaldehyde, aqueous	any	✣	✣ to ○	○	○
Benzaldehyde in isopropyl alcohol	1%	✣	✣	✣	○
Benzene	techn. grade	○	▭	○	▭
Benzene sulphonic acid		✣	✣	✣	✣
Benzoic acid, aqueous	any	✣	✣	✣	✣
Benzoyl chloride		○	○	▭	
Benzyl alcohol		✣	✣	✣	○
Benzyl chloride		○	▭	▭	
Bichromate – sulphuric acid	conc.	▭		▭	
Bismuth salts		✣	✣	✣	✣

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Bisulphite liquor		✚	✚		
Bitumen		✚	○▽	✚	○▽
Bleaching solution with 12.5 % active chlorine**		○	▭	○	▭
Bone oil		✚	✚	✚	✚
Borax (sodium tetraborate), aqueous	saturated	✚	✚	✚	✚
Boric acid, aqueous	any	✚	✚	✚	✚
Boric acid methyl ester		✚	○ to ▭	✚	▭
Boron trifluoride		✚	✚ to ○	✚	○
Brake fluid		✚	✚	✚	○
Brandy		✚	✚	✚	✚
Bromic acid	conc.	▭		▭	
Bromine, liquid	100 %	▭		▭	
Bromine vapours		▭		▭	
Bromine water	cold saturated	✚		✚	
Bromochloromethane		▭		▭	
1,3-butadiene, gaseous	techn. grade	○	▭		
Butanediol, aqueous	any	✚	✚	✚	✚
Butanetriol, aqueous	any	✚	✚	✚	✚
Butane, gaseous		✚			
Butanol, aqueous	any	✚	✚	✚	○
Butanone		✚	○ to ▭	✚	▭
2-Butenediol-1,4	techn. grade	✚		✚	
2-Butinediol-1,4	techn. grade	✚		✚	
Butoxyl® (methoxybutylacetate)		✚	○		
Butter		✚		✚	
Butylene glycol	techn. grade	✚	✚	✚	✚
Butyl acetate (acetic acid butyl ester)	techn. grade	✚	○	✚	○
Butyl acrylate		✚	○	✚	○
Butyl alcohol		✚	✚	✚	○
Butyl benzyl phthalate		✚	✚	○	○
Butyl glycol (ethylene glycol monobutylether)	techn. grade	✚		✚	
Butyl phenol	techn. grade	✚	✚	○	
Butyl phenone	techn. grade	▭		▭	
Butyl phthalate (dibutyl phthalate)	techn. grade	✚	○	○	○
Butyric acid, aqueous	any	✚	○	✚	○
Calcium carbide		✚	✚	✚	✚
Calcium carbonate		✚	✚	✚	✚
Calcium chlorate, aqueous	saturated	✚	✚	✚	✚
Calcium chloride, aqueous	saturated	✚	✚	✚	✚
Calcium hydroxide		✚	✚	✚	✚
Calcium hypochlorite, aqueous (suspension)	any	✚	✚	✚	✚
Calcium nitrate, aqueous	50 %	✚	✚	✚	✚
Calcium oxide (powder)		✚	✚	✚	✚

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Calcium phosphate		✚	✚	✚	✚
Calcium sulphate		✚	✚	✚	✚
Calcium sulphide, aqueous	≤ 10%	○	○		
Camphor		○	▭	○	▭
Camphor oil		▭		▭	
Cane sugar, aqueous	any	✚	✚	✚	✚
Carbazole		✚	✚		
Carbolic acid (phenol)		✚	✚▽	○	○▽
Carbolineum	as supplied commerc.	✚		○	
Carbolineum, aqueous (for fruit trees)		✚▽	○▽	○▽	○▽
Carbonic acid, aqueous	any	✚	✚	✚	✚
Carbonic acid, dry	100%	✚	✚		
Carbon dioxide	100%	✚	✚		
Carbon disulphide		○	▭	○	▭
Carbon monoxide, gaseous	techn. grade	✚	✚		
Carbon tetrachloride		○	▭	▭	▭
Castor oil		✚	✚	✚	○
Caustic soda solution	any	✚	✚	✚	✚
Cetyl alcohol (hexadecanol)		✚	✚	✚	
Chloral hydrate, aqueous	any	✚	✚▽	✚	✚▽
Chloral (trichloroacetaldehyde)	techn. grade	✚	✚		
Chloramine, aqueous	saturated	✚		✚	
Chloric acid, aqueous	1%	✚	✚	✚	✚
Chloric acid, aqueous	10%	✚	✚	✚	✚
Chlorinated lime		✚	✚	✚	✚
Chlorine, aqueous solution (chlorine water)	saturated	✚	○	✚	○
Chlorine, gaseous, dry		○	▭	○	▭
Chlorine, gaseous, moist		○	▭	○	▭
Chlorine, liquid		▭		▭	
Chlorine bleaching solution with 12.5% active chlorine		○	▭	○	▭
Chloroacetic acid, aqueous	≤ 85%	✚	✚	✚	✚
Chloroacetic acid (mono), aqueous	any	✚	✚	✚	○
Chlorobenzene		○	▭	○	▭
Chloroformic acid ester		✚	○		
Chloroform	techn. grade	○ to ▭	▭	▭	▭
Chloropicrin		✚ to ○	▭		
Chlorosulphonic acid	techn. grade	▭	▭	▭	▭
Chrome alum (potassium chromic sulphate), aqueous	saturated	✚	✚	✚	✚
Chrome anode slime		✚	✚	✚	✚
Chrome salts, aqueous	any	✚	✚	✚	✚
Chromic acid, aqueous**	50%	○	▭▽	○	▭▽
Chromium trioxide, aqueous**	50%	○	▭▽	○	▭▽
Chromosulphuric acid		▭		▭	
Cider		✚	✚	✚	✚

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Citric acid, aqueous	saturated	✚	✚	✚	✚
Citrus fruit juices		✚	✚	✚	✚
Clophen® A 50 and A 60®		✚	○ to ▭		
Coal tar oil		✚▽	○▽	✚▽	○▽
Coconut oil		✚	○	✚	○
Coconut oil alcohol	techn. grade	✚	○	✚	○
Cod liver oil		✚	○	✚	○
Coffee extract		✚	✚	✚	✚
Cognac		✚		✚	
Cola concentrates		✚	✚	✚	✚
Common salt, aqueous	any	✚	✚	✚	✚
Coolants and lubricants for metalworking		○	○		
Copper chloride, aqueous	saturated	✚	✚	✚	✚
Copper cyanide, aqueous	saturated	✚		✚	
Copper fluoride, aqueous	saturated	✚	✚	✚	✚
Copper nitrate, aqueous	30%	✚	✚	✚	✚
Copper salts, aqueous	cold saturated	✚	✚	✚	✚
Copper sulphate, aqueous	any	✚	✚	✚	✚
Corn oil		✚	○	✚	○
Cottonseed oil	techn. grade	✚	✚	✚	○
Coumarone resins		✚	✚		
Creasote		✚	✚▽		
Cresol	100%	✚	○▽	○	▭
Cresol, aqueous	dilute	✚	✚▽	✚	
Crop protection agents, aqueous	as supplied commerc.	✚	✚	✚	✚
Crotonaldehyde	techn. grade	✚	○	○	
Crude oil		✚	○	✚	○
Cyclanone (fatty alcohol sulphonate)	as supplied commerc.	✚	✚	✚	
Cyclohexane		✚	✚	✚	▭
Cyclohexanol		✚	✚	✚	✚
Cyclohexanone (anone)		✚	○	○	▭
Decahydronaphthalene (Dekalin®)	techn. grade	✚	○	○	▭
Defoamers		✚	✚ to ○	✚	○
Detergents		✚	✚	✚	✚
Detergents, synthetic	end use concentration	✚	✚	✚	✚
Developer solutions (photographic)		✚▽	✚▽	✚▽	✚▽
Dextrin (starch gum), aqueous	18%	✚	✚	✚	✚
Dextrose, aqueous	any	✚	✚	✚	✚
1,2-Diaminoethane (ethylenediamine)	techn. grade	✚	✚	✚	○
1,2-Dibromoethane		○	▭	▭	▭
Dibutyl ether		✚ to ○	▭	○	▭
Dibutyl phthalate (butyl phthalate)	techn. grade	✚	○	○	○
Dibutyl sebacate		✚	○	○	○

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Dichloroacetic acid	techn. grade	✚	○▽	✚	▭
Dichloroacetic acid	50%	✚	✚	✚	✚
Dichloroacetic acid methyl ester		✚	✚	○	▭
Dichlorobenzene		○	▭	▭	▭
Dichlorodiphenyltrichloroethane (DDT, powder)		✚	✚	✚	✚
Dichloroethane		○	○	▭	▭
1,1-Dichloroethylene (vinylidene chloride)	techn. grade	▭	▭	▭	▭
Dichloromethane**		○	○*	▭	▭*
Dichloropropane		○	▭	▭	▭
Dichloropropene		○	▭	▭	▭
Diesel fuel		✚	○	✚	▭
Diethanolamine	techn. grade	✚		✚	
Diethylene glyol		✚	✚	✚	✚
2-Diethylhexylphthalate (DOP)		✚	○	✚	
Diethylketone		✚	○	○	▭
Diethyl ether		✚ to ○	○*	○	
Diglycolic acid, aqueous	30%	✚	✚	✚	✚
Diisobutylketone	techn. grade	✚	○ to ▭	○	▭
Diisoctyl phthalate	techn. grade	✚	○	○	
Diisopropyl ether		✚ to ○	▭	○	▭
Dimethylamine		✚	○	○	▭
Dimethyl formamide	techn. grade	✚	✚ to ○	✚	○
Dimethyl sulphoxide		✚	✚	✚	
Dinonyl phthalate (DNP)	techn. grade	✚	○	○	
Dioctyl phthalate		✚	○	○	
Dioxane		✚	✚	✚	○
Diphenylamine		✚	○	✚	○
Diphenyl oxide		✚	○	✚	○
Disodium phosphate		✚	✚	✚	✚
Disodium sulphate		✚	✚	✚	✚
Dodecylbenzenesulphonic acid		✚	○	✚	○
Drinking water, also chlorinated		✚	✚	✚	✚
Dyes		✚▽	✚▽	✚▽	✚▽
Eau de Javelle (potassium hypochlorite bleaching solution)		✚ to ○	▭	✚ to ○	▭
Eau de Labarraque (sodium hypochlorite bleaching solution)		✚ to ○	▭	✚ to ○	▭
Electrolytic baths for electroplating		✚ to ○	○	✚ to ○	○
Emulsifiers		✚	✚	✚	
Emulsions (photographic)		✚	✚	✚	✚
Ephetin®, aqueous	10%	✚	✚	✚	✚
Epichlorohydrin		✚	✚	✚	✚
Essential oils		✚	✚	✚	○
Esters, aliphatic	techn. grade	✚	✚ to ○	✚ to ○	○ to ▭
Ethane		✚	✚		

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Ethanolamine (2-aminoethanol)	techn. grade	✚		✚	
Ethanol	96%	✚	✚	✚	✚
Ethanol denatured with toluene	96% (v/v)	✚		✚	
Ethereal oils		○	▭	○	▭
Ether		✚ to ○	○*	○	
Ethylenediamine tetraacetic acid		✚	✚	✚	✚
Ethylene		✚	✚		
Ethylene chloride		○	▭	○	▭
Ethylene chlorohydrin (chloroethanol)	techn. grade	✚	✚▽	✚	✚▽
Ethylene diamine (1,2-diaminoethane)	techn. grade	✚	✚	✚	○
Ethylene dibromide		○	▭	○	▭
Ethylene dichloride (dichloroethane)		○	▭	○	▭
Ethylene glycol		✚	✚	✚	✚
Ethylene glycol monobutyl ether (butyl glycol)	techn. grade	✚		✚	
Ethylene oxide, gaseous		✚	✚		
Ethyl acetate (acetic acid ethyl ester)	techn. grade	✚	○	○	▭
Ethyl alcohol	96%	✚	✚	✚	✚
Ethyl alcohol + acetic acid (fermentation mixture)	as used in production	✚	✚	✚	✚
Ethyl benzene	techn. grade	○		○	
Ethyl chloride (chloroethane)	techn. grade	○*		○*	
Ethyl ether (diethyl ether)	techn. grade	✚ to ○	○*	○	
2-Ethyl hexanol		✚	○	✚	○
Euron® B		○	○		
Euron® G		✚	✚		
Fatty acids (>C6)		✚	✚ to ○	✚	○
Fatty acid amides		✚	○	✚	○
Fatty alcohols		✚	○	✚	○
Fatty oils		✚	○	✚	○
Ferric alum (ferric ammonium sulphate), aqueous	saturated	✚	✚	✚	✚
Ferric chloride, aqueous	any	✚	✚	✚	✚
Ferric nitrate, aqueous	saturated	✚	✚	✚	✚
Ferric sulphate, aqueous	saturated	✚	✚	✚	✚
Ferrous chloride, aqueous	saturated	✚	✚	✚	✚
Ferrous sulphate, aqueous	saturated	✚	✚	✚	✚
Fertilizer salts, aqueous	any	✚	✚	✚	✚
Fixing salt, aqueous	any	✚	✚	✚	✚
Fixing salt, solid		✚	✚	✚	✚
Fluorine, gaseous		▭		▭	
Fluoroboric acid, aqueous		✚	○	✚	○
Fluorosilicic acid	any	✚	✚	✚	✚
Fluorosilicic acid, aqueous	any	✚	✚	✚	✚
Formaldehyde, aqueous	up to 40%	✚	✚	✚	✚
Formamide		✚	✚	✚	✚

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Formic acid, aqueous	10%	✚	✚	✚	✚
Formic acid, aqueous	85%	✚	✚	✚	✚
Frigen® 12 (Freon® 12)	100%	○	▭	○	▭
Fructose (fruit sugar), aqueous	any	✚	✚	✚	✚
Fruit juices, fermented		✚	✚	✚	✚
Fruit juices, unfermented	any	✚	✚	✚	✚
Fruit pulp		✚	✚	✚	✚
Fuel oil		✚	○	○	▭
Fuming sulphuric acid ($H_2SO_4 + SO_3$)	any	▭		▭	
Furfurol		✚	○	○	▭
Furfuryl alcohol		✚	✚▽	✚	✚▽
Gas, manufactured	as supplied commerc.	✚		✚	
Gas, natural	techn. grade	✚		✚	
Gas, liquor		✚	✚	✚	✚
Gasoline, regular-grade (DIN 51635)		✚	○	○	▭
Gelatin		✚	✚	✚	✚
Genantin®		✚	✚		
Gin		✚		✚	
Glacial acetic acid (100% acetic acid)	techn. grade	✚	○▽	✚	○▽
Glauber's salt, aqueous	any	✚	✚	✚	✚
Glucose, aqueous	any	✚	✚	✚	✚
Glue		✚	✚	✚	✚
Glycerin, aqueous	any	✚	✚	✚	✚
Glycerin chlorohydrin		✚	✚	✚	✚
Glycerol		✚	✚	✚	✚
Glycine		✚	✚	✚	✚
Glycolic acid, aqueous	up to 70%	✚	✚	✚	✚
Glycolic acid butyl ester		✚	✚	✚	
Glycol, aqueous	as supplied commerc.	✚	✚	✚	✚
Glysantin®		✚	✚	✚	✚
Grisiron® 8302		○	○		
Grisiron® 8702		✚	✚		
Halothan®		○	○ to ▭		
Heptane		✚	○	✚	▭
Hexafluorosilicic acid, aqueous	40%	✚	✚	✚	✚
Hexane		✚	○	✚	▭
Hexanetriol		✚	✚	✚	✚
Honey		✚	✚	✚	✚
Hydraulic fluid		✚	○	✚	
Hydrazine hydrate		✚	✚	✚	✚
Hydrobromic acid, aqueous	50%	✚	✚	✚	✚
Hydrochloric acid, aqueous	any	✚	✚	✚	✚

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Hydrocyanic acid		✚	✚	✚	✚
Hydrofluoric acid, aqueous	40-85 %	✚	○	✚	○
Hydrogen		✚	✚		
Hydrogen bromide, gaseous	techn. grade	✚	✚	✚	
Hydrogen chloride gas, dry and moist		✚	✚	✚	
Hydrogen peroxide, aqueous	10 %	○	▭	○	▭
Hydrogen peroxide, aqueous	30 %	○	▭	○	▭
Hydrogen peroxide	100 %	○	○	○	▭
Hydrogen sulphide, aqueous	saturated	✚	✚	✚	✚
Hydrogen sulphide, gaseous		✚	✚	✚	✚
Hydroquinone		✚▽	✚▽	✚▽	✚▽
Hydrosulphite, aqueous	up to 10 %	✚	✚	✚	✚
Hydroxylamine sulphate, aqueous	12 %	✚	✚	✚	✚
Hypochlorous acid		✚ to ○	○	○	
Ink		✚	✚	✚	✚
Iodine in potassium iodide solution	3 % iodine	✚	✚	✚	✚
Iodine tincture, DAB 6	as supplied commerc.	✚	○▽	✚	○▽
Isoamyl alcohol	techn. grade	✚	○	✚	○
Isobutyl alcohol (isobutanol)		✚	✚	✚	○
Isobutyric acid	techn. grade	✚	○	✚	○
Isooctane		✚	○	✚	▭
Isopropanol (isopropyl alcohol)	techn. grade	✚	✚	✚	✚
Isopropyl acetate	100 %	✚	○	✚	○
Isopropyl ether	techn. grade	✚ to ○	▭	○	▭
Jam		✚	✚	✚	✚
Kerosene		✚	○	○	▭
Ketones		✚ to ○	○ to ▭	✚ to ○	○ to ▭
Lactic acid, aqueous	any	✚	✚	✚	✚
Lactose (milk sugar)		✚	✚	✚	✚
Lanolin (wool fat)		✚	✚	✚	✚
Latex		✚	✚	✚	✚
Lead acetate, aqueous	any	✚	✚	✚	✚
Lead tetraethyl		✚		✚	
Lime		✚	✚	✚	✚
Lime water		✚	✚	✚	✚
Linseed oil	techn. grade	✚	✚	✚	○
Liqueur		✚	✚		
Liquid manure		✚	✚		
Liquid soaps		✚	✚	✚	✚
Lithium bromide		✚	✚	✚	✚

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Lubricating oils	techn. grade	✚	✚ to ○	✚	○
Lysol®		✚	○		
Machine oil		✚	○	✚	○
Magnesium carbonate		✚	✚	✚	✚
Magnesium chloride, aqueous	any	✚	✚	✚	✚
Magnesium fluorosilicate		✚	✚	✚	✚
Magnesium hydroxide		✚	✚	✚	✚
Magnesium iodide		✚	✚	✚	✚
Magnesium salts, aqueous	any	✚	✚	✚	✚
Magnesium sulphate, aqueous	any	✚	✚	✚	✚
Maleic acid, aqueous	up to 100%	✚	✚	✚	✚
Malic acid, aqueous	50%	✚	✚	✚	✚
Manganese sulphate		✚	✚	✚	✚
Margarine		✚	✚	✚	✚
Mash		✚	✚	✚	✚
Mayonnaise		✚		✚	
Menthol		✚	○	○	▭
Mercury		✚	✚	✚	✚
Mercury chloride		✚	✚	✚	✚
Mercury salts		✚	✚	✚	✚
Metal soaps		✚	✚	✚	✚
Methacrylic acid		✚	✚	✚	○
Methanol	techn. grade	✚	✚	✚	✚
Methoxybutanol		✚	○	✚	○
Methoxybutyl acetate (Butoxyl®)		✚	✚	✚	○
Methylamine, aqueous	32%	✚		✚	
2-Methylbutanol-2	techn. grade	✚	○	✚	○
Methylene chloride** (dichloromethane)		○	○*	▭	▭*
Methylisobutyl ketone		✚	○ to ▭	✚	▭
Methyl acetate (acetic acid methyl ester)	techn. grade	✚		✚	
Methyl acrylate		✚	✚	✚	○
Methyl alcohol		✚	✚	✚	✚
Methyl benzene		○	▭	○	▭
Methyl benzoic acids (toluic acids)	saturated	○		○	
Methyl bromide, gaseous	techn. grade	▭		▭	
Methyl bromide (bromomethane), gaseous	techn. grade	▭		▭	
Methyl chloride (chloromethane), gaseous	techn. grade	○		▭	
Methyl cyclohexane		○	○ to ▭	○	▭
Methyl ethyl ketone	techn. grade	✚	○	○	▭
Methyl glycol		✚	✚	✚	✚
Methyl methacrylate		✚	✚	✚	○
4-Methyl pentanol-2		✚	✚ to ○▽	✚	○▽
Methyl propyl ketone		✚	○	○	▭

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
N-Methyl pyrrolidone		✚	✚	✚	
Methyl salicylate (salicylic acid methyl ester)		✚	○	✚	○
Methyl sulphuric acid	50%	✚	✚	✚	✚
Milk		✚	✚	✚	✚
Mineral oil	without additives	✚	✚ to ○	✚	○
Mineral water		✚	✚	✚	✚
Molasses		✚	✚	✚	✚
Molasses wort		✚	✚	✚	✚
Monochloroacetic acid		✚	○	✚	○
Monochloroacetic acid ethyl ester		✚	✚	✚	○
Monochloroacetic acid methyl ester		✚	✚	✚	○
Monochlorobenzene		○	–	○	–
Mordants, metallic		✚		✚	
Morpholine		✚	✚	✚	
Motor oil (heavy duty oil)		✚	✚ to ○	✚	○
Mowilith® emulsions		✚	✚	✚	✚
Mustard		✚	✚	✚	✚
Nail polish remover		✚	○	✚	○
Naphthalene		✚	–	✚	–
Naphtha	techn. grade	✚	○	✚	○
Naphtha		✚	○	✚	○
Naphtha/benzene mixture	80/20	✚	○	✚	○
Nickel chloride		✚	✚	✚	✚
Nickel nitrate		✚	✚	✚	✚
Nickel salts, aqueous		✚	✚	✚	✚
Nickel sulphate, aqueous	any	✚	✚	✚	✚
Nicotine		✚	✚	✚	✚
Nicotinic acid	≤ 10%	✚		✚	
Nitric acid**	25%	✚	✚	✚	✚
Nitric acid**	50%	○	–	○	–
Nitric acid	95%	–	–	–	–
2,2‘,2“-Nitrilotriethanol (triethanolamine), aqueous	any	✚	○	✚	○
Nitrobenzene		✚	○	○	–
Nitrocellulose		✚		✚	
o-Nitrotoluene		✚	○	○	–
Nonyl alcohol (nonanol)		✚	✚	✚	○
Nut oil		✚		✚	
Octyl cresol	techn. grade	○	–	○	–
Oils, ethereal		○	–	○	–
Oils, vegetable and animal		✚	✚ to ○	✚	○
Oleic acid		✚	○	✚	○
Oleum		–	–	–	–

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Olive oil		✚	✚	✚	○
Optical brighteners		✚	✚	✚	✚
Orange juice		✚	✚	✚	✚
Oxalic acid, aqueous	any	✚	✚	✚	✚
Oxygen		✚	✚	✚	✚
Ozone	50 ppm	○	▭	○	▭
Palmitic acid		✚	✚	✚	✚
Palmityl alcohol		✚	✚	✚	✚
Palm nut oil		✚		✚	
Paraffin, liquid		✚	✚	✚	○
Paraffin wax emulsions	as supplied commerc.	✚	○	✚	○
Paraformaldehyde		✚	✚	✚	✚
Peanut oil	techn. grade	✚		✚	
Pentanol		✚		✚	
Peppermint oil		✚		✚	
Perchloric acid, aqueous	20%	✚	✚	✚	✚
Perchloric acid, aqueous	50%	✚	○	✚	○
Perchloric acid, aqueous	70%	✚	▭	✚	▭
Perchloroethylene		○	▭	▭	▭
Petrol, regular-grade (DIN 51 635)		✚	○	○	▭
Petroleum		✚	○	○	▭
Petroleum ether		✚	○	✚	
Phenolic resin moulding compounds		✚	✚	✚	✚
Phenol		✚	✚▽	○	○▽
Phenyl ethyl alcohol		✚	✚	✚	○
Phenyl hydrazine	techn. grade	○	○ to ▭	○	▭
Phenyl hydrazine hydrochloride		✚	▭	✚	▭
Phenyl sulphonate (sodium dodecyl benzene sulphonate)		✚	✚	✚	✚
Phosgene, gaseous		○			
Phosgene, liquid	100%	▭			
Phosphates, aqueous	any	✚	✚	✚	✚
Phosphoric acid, aqueous	50%	✚	✚	✚	✚
Phosphoric acid, aqueous	80% ... 95%	✚	○▽	✚	○▽
Phosphorus oxychloride		✚	○	✚	○
Phosphorus pentoxide	100%	✚	✚	✚	✚
Phosphorus trichloride		▭	▭	▭	▭
Photographic developers		✚▽	✚▽	✚▽	✚▽
Photographic emulsions	as supplied commerc.	✚	✚	✚	✚
Photographic fixing baths	as supplied commerc.	✚	✚	✚	✚
Phthalic acid, aqueous	50%	✚	✚	✚	✚
Phthalic acid dibutyl ester (dibutyl phthalate)	techn. grade	✚	○	○	○
Phthalic ester		✚	✚ to ○	✚	○
Picric acid, aqueous	1%	✚		✚	

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Pineapple juice		✚	✚	✚	✚
Pine needle oil		✚		✚	
Plasticisers		✚	○	○	○
Polyacrylic acid emulsions		✚	✚	✚	✚
Polyester plasticisers		✚	✚ to ○	○	○
Polyester resins		○	–	○	–
Polyglycols		✚	✚	✚	✚
Polysolvan® O (glycolic acid butyl ester)		✚	✚	✚	○
Potassium aluminium sulphate, aqueous	any	✚	✚	✚	✚
Potassium bicarbonate, aqueous	saturated	✚	✚	✚	✚
Potassium bisulphate, aqueous	saturated	✚	✚	✚	✚
Potassium bisulphite, aqueous	saturated	✚	✚	✚	✚
Potassium borate, aqueous	1%	✚	✚	✚	✚
Potassium bromate, aqueous	up to 10%	✚	✚	✚	✚
Potassium bromide, aqueous	any	✚	✚	✚	✚
Potassium carbonate, aqueous	any	✚	✚	✚	✚
Potassium chlorate, aqueous	any	✚	✚	✚	✚
Potassium chloride, aqueous	any	✚	✚	✚	✚
Potassium chromate, aqueous	40%	✚	✚	✚	✚
Potassium chromic sulphate (chrome alum), aqueous	saturated	✚	✚	✚	✚
Potassium cyanide, aqueous	any	✚	✚	✚	✚
Potassium dichromate, aqueous	any	✚	✚	✚	✚
Potassium ferrocyanide and ferricyanide, aqueous	any	✚	✚	✚	✚
Potassium fluoride, aqueous	any	✚	✚	✚	✚
Potassium hexacyanoferrate, aqueous	any	✚	✚	✚	✚
Potassium hydroxide		✚	✚	✚	✚
Potassium hydroxide, aqueous	any	✚	✚	✚	✚
Potassium hydroxide solution	50%	✚	✚	✚	✚
Potassium hypochlorite, aqueous	saturated	○	–	○	–
Potassium iodide, aqueous	any	✚	✚	✚	✚
Potassium nitrate, aqueous	any	✚	✚	✚	✚
Potassium perborate		✚	✚	✚	✚
Potassium perchlorate, aqueous	up to 10%	✚	○	✚	○
Potassium perchlorate, aqueous	1%	✚		✚	
Potassium permanganate	20%	✚	✚▽	✚	✚▽
Potassium permanganate, aqueous	up to 6%	✚	✚▽	✚	✚▽
Potassium persulphate, aqueous	any	✚	✚	✚	✚
Potassium phosphate, aqueous	saturated	✚	✚	✚	✚
Potassium sulphate, aqueous	any	✚	✚	✚	✚
Potassium sulphide, aqueous	saturated	✚	✚	✚	✚
Potassium sulphite, aqueous	saturated	✚	✚	✚	✚
Potassium tetracyanocuprate, aqueous	saturated	✚	✚	✚	✚
Potassium thiosulphate, aqueous	saturated	✚	✚	✚	✚
Propane, gaseous	techn. grade	✚			

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Propanol-(2) (isopropyl alcohol)		✚	✚	✚	✚
n-Propanol (n-propyl alcohol)		✚	✚	✚	✚
Propanol (propyl alcohol)		✚	✚	✚	✚
Propargyl alcohol, aqueous	7%	✚	✚	✚	✚
Propionic acid, aqueous	any	✚	✚	✚	✚
Propylene dichloride	100%	▭		▭	
Propylene glycol		✚	✚	✚	✚
Propylene oxide		✚	✚		
Pseudocumene		○	○		
Pyridine		✚	○	✚	○
Quinine		✚	✚	✚	✚
Release agents		✚	✚		
Roasting gases, dry	any	✚	✚		
Rubber dispersions (latex)		✚	✚	✚	✚
Sagrotan®		✚	○	✚	○
Salicylic acid		✚	✚	✚	✚
Salt brines	saturated	✚	✚	✚	✚
Saturated steam condensate		✚	✚	✚	✚
Sauerkraut (pickled cabbage)		✚	✚	✚	✚
Sea water		✚	✚	✚	✚
Silicic acid, aqueous	any	✚	✚	✚	✚
Silicone emulsion	as supplied commerc.	✚	✚	✚	✚
Silicone oil	techn. grade	✚	✚	✚	✚
Silver nitrate		✚	✚	✚	✚
Silver nitrate, aqueous	any	✚	✚	✚	✚
Silver salts, aqueous	cold saturated	✚	✚	✚	✚
Soap solution, aqueous	any	✚	✚	✚	✚
Soda (sodium carbonate), aqueous	any	✚	✚	✚	✚
Sodium acetate, aqueous	any	✚	✚	✚	✚
Sodium aluminium sulphate		✚	✚	✚	✚
Sodium benzoate, aqueous	any	✚	✚	✚	✚
Sodium bicarbonate, aqueous	saturated	✚	✚	✚	✚
Sodium bisulphate, aqueous	saturated	✚	✚	✚	✚
Sodium bisulphite, aqueous	saturated	✚	✚	✚	✚
Sodium borate		✚	✚	✚	✚
Sodium bromide		✚	✚	✚	✚
Sodium carbonate, aqueous	any	✚	✚	✚	✚
Sodium chlorate, aqueous	saturated	✚	✚	✚	✚
Sodium chloride, aqueous	any	✚	✚	✚	✚
Sodium chlorite, aqueous	50%	✚		✚	
Sodium chromate		✚	✚	✚	✚

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Sodium cyanide		✚	✚	✚	✚
Sodium dichromate		✚	✚	✚	✚
Sodium dodecylbenzenesulphonate		✚	✚	✚	✚
Sodium ferricyanide, aqueous	saturated	✚	✚	✚	✚
Sodium ferrocyanide		✚	✚	✚	✚
Sodium fluoride		✚	✚	✚	✚
Sodium hexametaphosphate, aqueous	saturated	✚	✚	✚	✚
Sodium hydroxide, aqueous	any	✚	✚	✚	✚
Sodium hydroxide, solid		✚	✚	✚	✚
Sodium hypochlorite, aqueous with 12.5 % active chlorine**		○	–	○	–
Sodium iron cyanide		✚	✚	✚	✚
Sodium nitrate, aqueous	any	✚	✚	✚	✚
Sodium nitrite, aqueous	any	✚	✚	✚	✚
Sodium perborate, aqueous	any	✚	○	✚	○
Sodium perchlorate, aqueous	any	✚	✚	✚	✚
Sodium peroxide, aqueous	saturated	○		○	
Sodium peroxide, aqueous	10 %	✚	✚	✚	✚
Sodium phosphate, aqueous	saturated	✚	✚	✚	✚
Sodium silicate		✚	✚	✚	✚
Sodium silicate, aqueous	any	✚	✚	✚	✚
Sodium sulphate, aqueous	cold saturated	✚	✚	✚	✚
Sodium sulphide, aqueous	any	✚	✚	✚	✚
Sodium tetraborate (borax), aqueous	saturated	✚	✚	✚	✚
Sodium thiosulphate, aqueous	saturated	✚	✚	✚	✚
Soft soap		✚	✚	✚	✚
Soya bean oil		✚	✚	✚	○
Spermaceti		✚		○	
Spindle oil		✚ to ○	○	○	
Spirits		✚		✚	
Stain remover		✚ to ○	○	○	
Starch, aqueous	any	✚	✚	✚	✚
Starch gum (dextrin), aqueous	18 %	✚	✚	✚	✚
Starch syrup		✚	✚	✚	✚
Stearic acid		✚	○	✚	○
Styrene		○	–	○	–
Succinic acid, aqueous	50 %	✚	✚	✚	✚
Sugar beet juice		✚	✚	✚	✚
Sugar syrup		✚	✚	✚	✚
Sulphates, aqueous solutions	any	✚	✚	✚	✚
Sulphur		✚	✚	✚	✚
Sulphuric acid, aqueous	up to 50 %	✚	✚	✚	✚
Sulphuric acid, aqueous	70 %	✚	○	✚	○
Sulphuric acid, aqueous	80 %	✚	○	✚	○
Sulphuric acid, aqueous	98 %	○[1)]	–	○	–

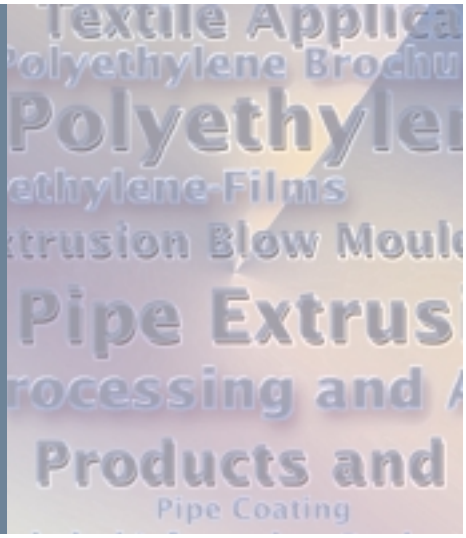
1) *Lupolen* and *Hostalen* blow mouldings that have been approved for use with dangerous filling substances are suitable for contact with e. g. 98 % Sulphuric acid

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Sulphurous acid		✚	✚	✚	✚
Sulphuryl chloride (sulphonyl chloride)		▭		▭	
Sulphur dioxide, aqueous	any	✚	✚	✚	✚
Sulphur dioxide, gaseous		✚	✚		
Sulphur trioxide		▭		▭	
Tallow	techn. grade	✚	✚	✚	✚
Tannic acid (tannin), aqueous	10%	✚	✚	✚	✚
Tanning extracts, vegetable	as supplied	✚		✚	
Tartaric acid, aqueous	any	✚	✚	✚	✚
Tetrabromomethane		○ to ▭	▭	▭	▭
Tetrachloroethane		○ to ▭	▭	▭	▭
Tetrachloroethylene		○ to ▭	▭	▭	▭
Tetrachloromethane (carbon tetrachloride)	techn. grade	○	▭	▭	▭
Tetrahydrofuran	techn. grade	○ to ▭	▭	▭	▭
Tetrahydronaphthalene (Tetralin®)	techn. grade	✚	▭	○	▭
Thioglycolic acid		✚	✚	✚	✚
Thionyl chloride		▭		▭	
Thiophene		○	▭	○	▭
Tin (II) chloride, aqueous	any	✚	✚	✚	✚
Tin (IV) chloride, aqueous	saturated	✚	✚	✚	✚
Toluene	techn. grade	○	▭	○	▭
Toluic acids (methyl benzoic acids)	saturated	○		○	
Tomato juice		✚	✚	✚	✚
Transformer oil (insulating oil)	techn. grade	✚	○	✚	○
Tributyl phosphate		✚	✚	✚	
Trichloroacetaldehyde (chloral)	techn. grade	✚	✚	○	▭
Trichloroacetic acid	techn. grade	✚	○ to ▭	○	▭
Trichloroacetic acid, aqueous	50%	✚	✚	✚	✚
Trichlorobenzene		▭	▭	▭	▭
Trichloroethylene	techn. grade	○ to ▭	▭	▭	▭
Tri-ß-chloroethylphosphate		✚	✚	✚	
Tricresyl phosphate		✚	✚	✚	
Triethanolamine		✚	✚▽	✚	○▽
Triethanolamine (2,2‘2“-nitrilotriethanol), aqueous	any	✚	○	✚	○
Triethylene glycol		✚	✚	✚	✚
Trilon®		✚	✚		
Trimethylol propane, aqueous		✚	✚	✚	✚
Trimethyl borate		✚	○ to ▭	✚	▭
Trioctyl phosphate		✚	○	✚	
Trisodium phosphate		✚	✚	✚	✚
Turpentine oil	techn. grade	✚ to ○	▭	○	▭
Tutogen® U		✚	✚		
Tween® 20 and 80		✚	▭		
Two-stroke oil		✚	○		

The resistance of *Lupolen*, *Lupolex*, *Luflexen* and *Hostalen* resins to chemicals

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Urea, aqueous	up to 33%	✚	✚	✚	✚
Uric acid		✚	✚	✚	✚
Urine		✚	✚	✚	✚
Vaseline	techn. grade	✚ to ○	○	○	○
Vaseline oil	techn. grade	✚ to ○	○	○	○
Vinegar (wine vinegar)	as supplied commerc.	✚	✚	✚	✚
Vinylidene chloride (1,1-dichloroethylene)	techn. grade	–		–	
Vinyl acetate		✚	✚	✚	○
Viscose spinning solutions		✚	✚	✚	✚
Vitamin C		✚		✚	
Vitamin preparations, dry (powder)		✚		✚	
Walnut oil		✚	○	✚	○
Washing up liquids	usual	✚	✚	✚	✚
Waste gases containing carbonic acid	any	✚	✚		
Waste gases containing carbon dioxide	any	✚	✚		
Waste gases containing carbon monoxide	any	✚	✚		
Waste gases containing hydrochloric acid	any	✚	✚		
Waste gases containing hydrogen fluoride	trace	✚	✚		
Waste gases containing nitrogen oxides	trace	✚	✚		
Waste gases containing sulphur dioxide	low	✚	✚		
Waste gases containing sulphuric acid (moist)	any	p	p		
Waste gases containing sulphur trioxide					
(fuming sulphuric acid)	trace	–		–	
Water, distilled		✚	✚	✚	✚
Waxes		✚	✚ to ○	✚	○
Wax alcohols	techn. grade	○	○		
Whey		✚	✚	✚	✚
Whisky		✚		✚	
White spirit	techn. grade	✚		○	
Wine		✚		✚	
Wine vinegar (table vinegar)	as supplied commerc.	✚	✚	✚	✚
Wood stains	end use concentration	✚	✚ to ○		
Xylene		○	–	○	–
Yeast		✚	✚	✚	✚
Zinc carbonate		✚	✚	✚	✚
Zinc chloride, aqueous	any	✚	✚	✚	✚
Zinc oxide		✚	✚	✚	✚
Zinc salts, aqueous	any	✚	✚	✚	✚
Zinc sludge		✚	✚	✚	✚

Substance	Concentration	Behaviour of MDPE/HDPE at		Behaviour of LDPE/LLDPE/ mLLDPE at	
		20 °C	60 °C	20 °C	60 °C
Zinc stearate		✜	✜	✜	✜
Zinc sulphate, aqueous	any	✜	✜	✜	✜



Literature

Resistance factor for pressure pipes

A special assessment is required when mechanical, chemical and, in some cases, thermal stresses occur together in applications such as pressure pipes or large tanks. Here the resistance factor (f_{CR}) gives vital information. It characterises the long-term behaviour of pipes in contact with a certain substance under pressure in relation to their long-term behaviour in contact with water under pressure. Resistance factors have been determined for polyethylene pipes in contact with a whole range of substances [1] [2] [3].

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