



HMC Polymers

A Most Admired Company

An associate of PTTGC & LyondellBasell

Polypropylene Chemical Resistance Guide

Chemical Listing & Ratings



About HMC Polymers

The spirit of discovery that created the polyolefins industry and one of the most versatile and widely used family of plastics in the world – polypropylene – is alive at HMC Polymers and through our technology and joint-venture heritage.

We work in close cooperation with our customers to improve existing products and develop new resins for the rapidly changing markets we serve. The company offers a wide range of products suitable for all major applications and processes, as well as innovative new products with expanded capabilities, which are used by customers to replace traditional materials and other plastics.

We have expertise in converting our products with a variety of leading process technologies to ensure our customers are able to obtain polypropylene grades optimised for their market needs.

Polypropylene products produced by HMC Polymers are the essential building blocks used to manufacture countless everyday goods such as consumer products, fresh food packaging, automotive and electrical components, durable textiles, medical applications, pipe systems and many others.

PP chemical resistance

HMC Polymers' polypropylene resins, like most polyolefins, are highly resistant to solvents and chemicals.

The results of extensive laboratory and actual field installation tests of polypropylene's chemical resistance are reported in this downloadable PDF which is periodically updated.

The chemical resistance data presented in this PDF for a range of over 260 chemicals and substances is based on ASTM D543.

Testing

Unstressed resin specimens are used measuring 76mm (3") long x 0.635mm (0.025") thick, in the shape of dumbbells. Results are reported after 1 month immersion. Important: As it is difficult to create actual service conditions in the laboratory, the results of many of the environments should be taken only as an indication of behaviour in service.

PP chemical resistance capability

HMC polypropylene resins have outstanding resistance to water and other inorganic environments. In most aqueous environments, its weight increase is less than 0.2% when it has been stored for 6 months at ambient temperatures. When the temperature is increased to 60°C (140°F), the weight increase is less than 0.5% for a similar period. According to ASTM D570, its 24 hr water absorption rate is 0.03%. It resists most strong mineral acids and bases, but, like the other polyolefins, it is subject to attack by oxidizing agents.

HMC PP resins are appreciably affected by chlorosulfonic acid and oleum at room temperature, 98% sulfuric acid, 30% hydrochloric acid, and 30% hydrogen peroxide at 100°C (212°F). They are also affected by 98% sulfuric acid at 60°C (140°F) and fuming nitric acid and liquid bromine at room temperatures. Under strain, failure could occur with strong oxidizing acids at temperatures lower than those mentioned. With few exceptions however, inorganic chemicals produce little or no effect on HMC PP resins over a period of 6 months at temperatures up to 120°C (248°F).

The permeation resistance of HMC PP resins to organic chemicals depends on the rate and extent to which absorption occurs. This, in turn, affects the suitability of the resin to serve in a particular environment. When the resin is removed from the environment, evaporation will take place and cause it to return almost to its original dimensions. Property changes resulting from the absorption will be reversed if evaporation is complete.

Temperature and polarity of the organic medium are the foremost factors in determining the extent of absorption by polypropylene. Absorption becomes greater as temperatures are increased and polarity of the medium is decreased. Polypropylene copolymers swell more than homopolymers, indicating greater absorption.

Such nonpolar liquids as benzene, carbon tetrachloride, and petroleum ether have a higher absorption rate with polypropylene than polar media such as ethanol and acetone.

Some reduction in tensile strength and an increase in flexibility and elongation-to-break in tension can be expected, depending on the nature and amount of the organic medium absorbed.

HMC PP resins have excellent resistance to environmental stress-cracking. When they are tested according to ASTM D1693 the brittle fractures that occur with certain polyethylenes in contact with polar organic liquids, detergents, and silicone fluids are not observed. Failure of this type with polypropylene is rare. Those environments known to cause such cracking to polypropylene are 98% sulfuric acid, concentrated chromic/sulfuric acid mixtures, and concentrated hydrochloric acid/chlorine mixtures.

The useful life of HMC PP resins at elevated temperatures is limited by oxidative degradation. The expected life of poly-propylene at any given temperature is also determined by the nature of the environment, and by the extraction of some of the anti-oxidant system. Any environment that tends to extract the antioxidants may lead to more rapid breakdown of the polypropylene, especially at elevated temperatures.

HMC Polymers produces a wide range of *Moplen* polypropylene grades including homopolymer, heterophasic and random copolymer resins, as well as specialty polypropylene resins such as *Adstif*, *Clyrell*, *Purell*, *Adsyl* and *Hostalen* PP.

Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Acetic acid	a. 50	+	+		+	
Acetic acid	a. 10	+	+		+	+
Acetic acid (glacial)	100	+	±	-	+	
Acetic anhydride	100	+			+	
Acetone	100	+	+	(b)	+	
Acrylonitrile	100	+			+	
Allyl alcohol	a. 96	+	+		+	
Aluminium salts	a. all	+	+	+	+	+
Alums (all types)	a. all	+	+		+	+
Ammonia	a. 30	+	+		+	
Ammonia	a. 10	+	+		+	+
Ammonia, gaseous	100	+	+			
Ammonia, liquid	100	+				
Ammonium acetate	a. all	+	+	+	+	+
Ammonium carbonate	a. all	+	+	+	+	+
Ammonium chloride	a. all	+	+	+	+	+
Ammonium nitrate	a. all	+	+	+	+	+
Ammonium phosphate	a. all	+	+	+	+	+
Ammonium sulphate	a. all	+	+	+	+	+
Amyl acetate	100	±	-		±	
Amyl alcohol	100	+	+		+	
Aniline	100	+	+		+	
Anisole	100	±			±	
Barium salts	a. all	+	+	+	+	+
Benzaldehyde	100	+			+	
Benzaldehyde	a. cold sat.	+			+	
Benzene	100	±	-		-	
Benzoic acid	100	+	+		+	
Benzoic acid	a. cold sat.	+	+	+	+	+
Benzyl alcohol	100	+	±		+	
Borax	a. cold sat.	+	+		+	+
Boric acid	100	+	+		+	
Boric acid	a. cold sat.	+	+		+	+
Bromine vapour	high	-			-	
Bromine vapour	Low	±	-		-	
Bromine water	cold sat.	-			-	
Bromine, liquid	100	-			-	

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Butane, gaseous	100	+	+			
Butane, liquid	100	+				
1,4-Butane diol	100	+	+		+	
Butane diol	100	+	+		+	
Butyl acetate	100	±	-		±	
n-Butyl alcohol (n-Butanol)	100	+			+	
Butyl glycol	100	+			+	
Calcium carbonate	a. cold sat.	+	+	+	+	+
Calcium chloride	a. cold sat.	+	+	+	+	+
Calcium hypochlorite	a. all	+	+		+	
Calcium nitrate	a. cold sat.	+	+		+	+
Carbon disulphide	100	±			±	
Carbon tetrachloride	100	-			-	
Chlorine water	cold sat.	±	-		-	
Chlorine, gas, dry	100	-			-	
Chlorine, gas, moist	10	±	-		-	
Chlorine, liquid	100	-			-	
Chloroacetic acid	100	+			±	
Chlorobenzene	100	±	-		-	
Chloroform	100	±	-		-	
Chlorosulphonic acid	100	-			-	
Chromium salts (dibasic, tri basic)	a. cold. sat.	+	+		+	+
Chromium trioxide (Chromic acid)	a. cold. sat.	±	-			
Chromium trioxide	a. 20	+	±		+	
Citric acid	a. cold sat.	+	+	+	+	+
Copper salts	a. cold sat.	+	+		+	
Cresols	100	+	±		+	
Cresols	a. cold sat.	+			+	
Cyclohexane	100	±			-	
Cyclohexanol	100	+	±		+	
Cyclohexanone	100	+	-		±	
Decahydronaphthaline	100	±	-		-	
Diethylether	100	±			±	
Diisopropylether	100	±	-		±	
Dimethylformamide	100	+			+	
1,4-Dioxan	100	±	±	-	±	

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Ethyl acetate	100	±	±		±	
Ethyl alcohol	100	+			+	
Ethyl alcohol	a. 96	+			+	
Ethyl alcohol	a. 50	+			+	
Ethyl alcohol	a. 10	+			+	
Ethyl chloride	100	– (b)			– (b)	
Ethylbenzene	100	±	–		–	
Ethylene chloride	100	±			±	
2-Ethylhexanol	100	+			+	
Formaldehyde	a. 40	+			+	
Formaldehyde	a. 30	+			+	
Formaldehyde	a. 10	+			+	
Formic acid	a. 98	+			+	
Formic acid	a. 85	+			+	
Formic acid	a. 50	+			+	
Formic acid	a. 10	+			+	
Fructose	a. cold sat.	+	+	+	+	+
Glucose	a. cold sat.	+	+	+	+	+
Glycerine	100	+			+	
Glycerine	a. all	+			+	
Glycol	100	+			+	
Glycol	a. all	+			+	
n-Heptane	100	±			–	
n-Hexane	100	±			–	
Hydrobromic acid	50	+			+	
Hydrochloric acid	36	+			+	
Hydrochloric acid	10	+			+	+
Hydrofluoric acid	40	+			+	
Hydrogen chloride, gas	all	+			+	
Hydrogen peroxide	30	+			±	
Hydrogen peroxide	3	+			+	
Hydrogen sulphide	a. low	+			+	
Iron salt	a. cold sat.	+	+	+	+	+
Isooctane	100	±			–	

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Isopropylalcohol	100	+	+		+	
Lactic acid	a. 90	+	+		+	
Lactic acid	a. 50	+	+		+	
Lactic acid	a. 10	+	+	+	+	+
Magnesium salts	a. cold sat.	+	+	+	+	+
Menthol	100	+			+	
Mercury	100	+	+		+	
Mercury salts	a. cold sat.	+	+		+	+
Methyl acetate	100	+	+	(b)	±	
Methyl alcohol	a. 50	+	+		+	
Methyl alcohol (methanol)	100	+	+	(b)	+	
Methyl ethyl ketone	100	+	±		±	
Methylene chloride	100	±			-	
Morpholine	100	+	+		+	
Naphthaline	100	+				
Nickel salts	a. cold sat.	+	+		+	+
Nitric acid	68	-	-		-	
Nitric acid	50	±	-		-	
Nitric acid	25	+	±		±	
Nitric acid	10	+	+		+	
Nitrobenzene	100	+	±		+	
Oleic acid	100	+			+	
Oxalic acid	a. cold sat.	+	±		+	
Ozone (< 0.5 ppm)		+	±			
Perchloroethylene (see tetrachloroethylene)						
Phenol	100	+	+		+	
Phenol	a. cold sat.	+	+		+	
Phosphoric acid	85	+	+		+	
Phosphoric acid	50	+	+		+	
Phosphoric acid	10	+	+	+	+	+
Phosphorus oxychloride	100	+	±			
Phosphorus pentoxide	100	+			+	
Phosphorus trichloride	100	+			±	

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Phthalic acid	a. 50	+	+		+	
Potassium carbonate (potash)	a. cold sat.	+	+		+	+
Potassium chlorate	a. cold sat.	+	+		+	
Potassium chloride	a. cold sat.	+	+	+	+	+
Potassium dichromate	a. cold sat.	+	+	+	+	
Potassium hydroxide solution	50	+	+		+	+
Potassium hydroxide solution	25	+	+		+	+
Potassium hydroxide solution	10	+	+		+	+
Potassium iodide	a. cold sat.	+	+		+	+
Potassium nitrate	a. cold sat.	+	+		+	+
Potassium permanganate	a. cold sat.	+	+		+	
Potassium persulphate	a. cold sat.	+			+	
Potassium sulphate	a. cold sat.	+	+		+	+
Propane, gas	100	+	+			
Propane, liquid	100	+				
Propionic acid	a. 50	+	+		+	
Propylene glycol	100	+	+		+	
Pyridine	100	±	±		±	
Silver salt	a. cold sat.	+	+		+	+
Sodium acetate	a. cold sat.	+	+	+	+	+
Sodium bisulphite	a. cold sat.	+	+		+	
Sodium carbonate	a. cold sat.	+	+		+	+
Sodium carbonate	a. 10	+	+	+	+	+
Sodium chlorate	a. 25	+	+		+	
Sodium chloride (common salt)	a. cold sat.	+	+	+	+	+
Sodium chlorite	a. 5	+			+	
Sodium hydrogen carbonate (sodium bicarbonate)	a. cold sat.	+	+	+	+	+
Sodium hydroxide (caustic soda)	100	+	+		+	
Sodium hydroxide solution	50	+	+		+	+
Sodium hydroxide solution	25	+	+		+	+
Sodium hydroxide solution	10	+	+	+	+	+
Sodium hypochlorite	a. 13	±	±			
Sodium nitrate	a. cold sat.	+	+		+	+
Sodium nitrite	a. cold sat.	+			+	
Sodium perborate	a. cold sat.	+	+	+	+	+
Sodium phosphate	a. cold sat.	+	+	+	+	+

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Chemicals						
Sodium sulphate	a. cold sat.	+	+	+	+	+
Sodium sulphide	a. cold sat.	+	+		+	+
Sodium sulphite	a. cold sat.	+	+		+	+
Sodium thiosulphate (fixing salt)	a. cold sat.	+	+		+	+
Stearic acid	100	+			+	
Succinic acid	a. cold sat.	+	+		+	+
Sulphur	100	+	+	+	+	
Sulphur dioxide	all	+	+		+	
Sulphuric acid	98	±	-		±	
Sulphuric acid	85	+	±		±	
Sulphuric acid	50	+	+		+	
Sulphuric acid	10	+	+	+	+	+
Tartaric acids	a. cold sat.	+	+		+	+
Tetrachloroethane	100	±	-		-	
Tetrachloroethylene (perchloroethylene)	100	±	-		-	
Tetrahydrofurane	100	±	-		-	
Tetrahydronaphthaline	100	±	-		-	
Thiophene	100	±	-		±	
Tin(II) chloride	a. cold sat.	+	+		+	+
Toluene	100	±	-		-	
Trichloroethylene	100	±	-		-	
Urea	a. cold sat.	+	+		+	+
Water	100	+	+	+	+	+
Xylene	100	±	-		-	
Zinc salts	a. cold sat.	+	+		+	+

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Industrial commodities, cosmetics						
Acronal® dispersion		+				+
Anti-freeze		+	+	+		+
Asphalt ¹		+	±			+
Battery acid		+	+			+
Beeswax		+	±			+
Bleaching solution (12.5% active chlorine)		+	±			
Bone oil		+	+			+
Brake fluid ¹		+	+			
Chlorinated lime (aqueous suspension)		+	+			
Chrome baths ¹ (ind.)		+	+			
Chromic-sulphuric acid mixture		-				-
Detergent	a. commercial	+				+
	a. ready for use	+	+	+		+
Dextrin	a. cold sat.	+				+
Diesel oil		±				
Engine oil ¹		+	±	-		+
Fatty alcohol sulphonate		+				+
Fir-needle oil		+	+			
Fixing salt	a. all	+	+			+
Floor polish ¹		+	±			
Fuel oils ¹		±	±			-
Furniture polish ¹		+	±	-		
Ink ¹		+	+			+
Kerosene		±	±			-
Lanolin® (wool fat)		+	±			+
Linseed oil		+	+			+
Lysol®		+	±			+

¹ Resistance is dependent on composition

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		20°C	60°C	100°C	20°C	60°C
Industrial commodities, cosmetics						
Mineral oils (free from aromatic hydrocarbons) ¹		+	±	-		
Nail varnish remover ¹		+	±			
Nail varnish ¹		+	±			
Oleum	all	-				-
Paraffin		+	+	-		+
Paraffin oil		+	±	-		+
Perfume		+				+
Petroleum		±	±			-
Petroleum ether		±	±			-
Photographic developer	a. commercial	+	+			+
	a. ready for use	+	+			+
Pine-needle oil		+	+			
Raw gasoline		±	-			-
Sagrotan®		+	±			
Shampoo ¹		+	+			+
Shoe polish ¹		+	±			
Silicon oils ¹		+	+	+		+
Soap (bar)		+	+			+
Soap solution		+	+			+
Soft soap		+	+			+
Softener						
- Dibutylphthalate		+				+
- Diisononylphthalate		+				+
- Dioctyladipate		+				+
- Dioctylphthalate		+				+
- Tricresylphosphate		+				
- Trioctylphosphate		+				
Standard grade petrol		±	-			-
Super grade petrol		±	-			-

¹ Resistance is dependent on composition

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Product enquiries: sales@hmcpolymers.com

10.2021

Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Industrial commodities, cosmetics						
Tar ¹		+	±			
Terpentine		±	-			-
Toothpastes		+	+			+
Transformer oil ¹		+	±			
Vaseline		+	±			+
Washing-up liquid	a. commercial	+				+
	a. ready for use	+	+	+		+
Water glass		+	+			+
White spirit		±	-			-
Foodstuffs						
Apple juice		+	+			+
Apple purée		+	+	+		+
Beef dripping		+	+			+
Beer		+				+
Bitter almond oil		+				+
Blancmange		+	+	+		+
Brandy		+				+
Butter		+	+			+
Buttermilk		+				+
Cake		+	+	+		+
Cheese		+				+
Cinnamon		+				+
Clove oil		+	±			
Cloves (spice)		+				+
Cocoa (prepared)		+	+	+		+
Cocoa powder		+				+
Coconut oil		+	+			+
Coffee (beans and ground)		+				+
Coffee (prepared)		+	+	+		+
Cola drink		+				+
Corn oil		+	±			+
Cream, whipped cream		+				+

¹ Resistance is dependent on composition

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Foodstuffs						
Curds		+			+	
Edible oil, vegetable		+	±		+	
Edible oil, animal		+	±		+	
Fish, pickled		+	+	+	+	
Flour		+			+	
Fruit juices		+	+		+	+
Fruit salad		+			+	
Gelatine	a. all	+	+		+	
Gin		+				
Grapefruit juice		+	+		+	+
Honey		+	+		+	+
Horseradish (prepared)		+			+	
Jam		+	+	+	+	
Jelly		+	+	+	+	+
Kippers		+			+	
Lemon flavouring		+				
Lemon juice		+	+		+	+
Lemon oil		+				
Lemon peel		+				
Lemonades		+			+	
Liqueurs	all	+			+	
Liver oil		+			+	
Margarine		+	+		+	
Mayonnaise		+			+	
Milk		+	+	+	+	+
Milk products		+	+	+	+	+
Mineral water		+	+	+	+	+
Mustard		+			+	

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Foodstuffs						
Olive oil		+	+		+	
Orange juice		+	+		+	+
Orange peel		+				
Orange oil (sweet)		+				
Palm oil		+	±		+	
Paprika (spice)		+			+	
Peanut oil		+	+	±	+	
Pectin	a. cold sat.	+	+		+	
Pepper		+				
Peppermint oil		+				
Pineapple juice		+	+		+	+
Pork dripping		+	+	±	+	
Potato (mashed)		+	+		+	+
Potato salad		+			+	
Rum		+	+		+	
Rum flavouring		+				
Salt (dry)		+	+	+	+	
Salt water	all	+	+	+	+	+
Sauerkraut (prepared)		+	+	+	+	+
Sausage		+	+		+	
Soda water		+			+	
Soya oil		+	±		+	
Starch, starch solution	a. all	+	+		+	
Sugar beet syrup		+	+	+	+	
Sugar solution	a. all	+	+	+	+	
Sugar, dry		+	+	+	+	
Tea (prepared)		+	+	+	+	+
Tea leaves		+	+		+	
Tomato juice		+	+		+	+
Tomato ketchup		+	+		+	
Vanilla		+			+	
Vegetables		+	+	+	+	+
Vinegar	commercial	+	+		+	+

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Substance	Concentration by mass (%)	Homopolymer Heterophasic Copolymer			Random Copolymer	
		20°C	60°C	100°C	20°C	60°C
Foodstuffs						
Whisky		+			+	
Wine, mulled wine		+	+		+	+
Yeast	a. all	+			+	

Note:

The information submitted in this publication is based on our current knowledge and experience. In view of the many factors that may affect processing and application, this data do not relieve processors of the responsibility of carrying out their own tests and experiments; neither does it imply any legally binding assurance of certain properties or of suitability for a specific purpose. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed.

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HMC Polymers is proud to be located in Thailand to serve the Asian and global markets. Our Head Office is in Bangkok and production facilities are located in Map Ta Phut Industrial Estate and Hemaraj Eastern Industrial Estate, Rayong province.

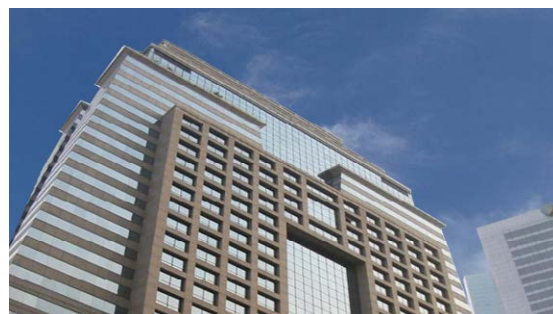
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