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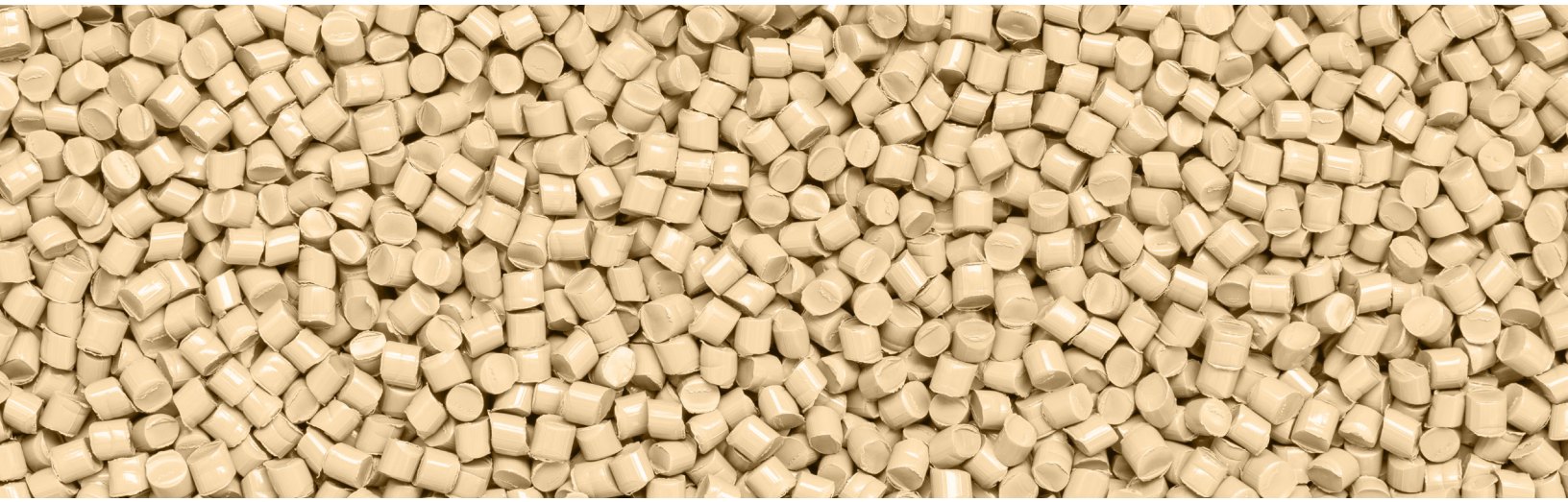

CHEMICAL COMPATIBILITY OF PEEK

Polyether ether ketone, or PEEK, is a high-performance and increasingly popular engineered thermoplastic. PEEK is a member of the polyaryletherketone (PAEK) family, which is known for such performance characteristics as excellent mechanical properties and broad chemical resistance. Furthermore, PAEK family polymers retain these attributes even at high temperatures, and thus their thermal stability has become one of their hallmarks. In addition to excellent heat tolerance, PEEK possesses one of the highest strength-to-weight ratios of any thermoplastic. This material can be used as an alternative to other materials such as aluminum, steel, glass, and other polymers.

PEEK is produced most immediately from difluorobenzophenone and disodium hydroquinone **(Fig 1)**. Often compared to fluoropolymers such as PTFE or PFA, PEEK polymer, however, does not contain fluorine. Still, PEEK exhibits many of the same high-performing and beneficial features of these fluoropolymers, including a working temperature up to 260 °C (500 °F) and excellent chemical resistance to a wide range of organic and inorganic chemicals, supporting its use not only in harsh industrial applications, but also within the body.

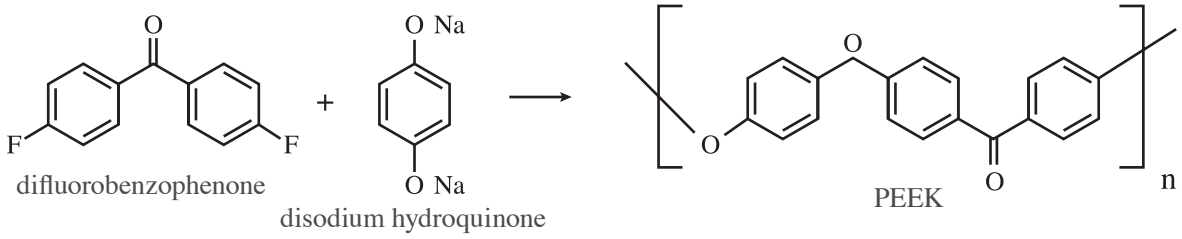

Figure 1: PEEK synthesis and immediate precursors. PEEK is synthesized most immediately from difluorobenzophenone and disodium hydroquinone. Note that PEEK does not contain fluorine and therefore is not a fluoropolymer. PEEK is a halogen-free material. [1]

PEEK CHEMICAL COMPATIBILITY

To showcase PEEK's compatibility with many organic and inorganic chemicals, raw material manufacturers made test bars of PEEK that were immersed in chemicals for a minimum of 7 days at 23 °C (73.4 °F), 100 °C (212 °F), and 200 °C (392 °F) (**Table. 1**). The compatibility of PEEK with these chemicals at room and elevated temperatures is represented by A, B, or C grading:

A. No interaction. B. Slight interaction. C. Severe interaction.

Table 1: PEEK Chemical Compatibility

Chemical	23 °C (73.4 °F)	100 °C (212 °F)	200 °C (392 °C)
ACIDS			
Acetic Acid, 10% Conc.	A	A	
Acetic Acid, Conc.	A	A	A
Acetic Acid, Glacial	A	A	
Acrylic Acid	A	A	
Aqua Regia	C	C	C
Benzene Sulfonic Acid	C		
Benzoic Acid	A	A	
Boric Acid	A	A	
Carbolic Acid	A		
Carbonic Acid	A	A	
Chloroacetic Acid	A	A	
Chlorosulfonic Acid	C	C	C
Chromic Acid, 40% Conc.	A		
Chromic Acid, Conc.	C	C	C
Citric Acid	A	A	
Formic Acid	B	B	
Hydrobromic Acid	C	C	C
Hydrochloric Acid, 10% Conc.	A	A	
Hydrochloric Acid, Conc.	A	B	
Hydrocyanic Acid	A	A	
Hydrofluoric Acid, 40% Conc.	C	C	C
Lactic Acid	A	A	
Maleic Acid	A	A	
Nitric Acid, 10% Conc.	A	A	
Nitric Acid, 30% Conc.	B		
Nitric Acid, 50% Conc.	C	C	C
Nitric Acid, Conc.	C	C	C
Nitrous Acid, 10% Conc.	A		
Oleic Acid	A		
Oleum	C	C	C
Oxalic Acid	A	A	
Perchloric Acid	A	A	
Phosphoric Acid, 10% Conc.	A	A	A
Phosphoric Acid, 50% Conc.	A	A	A
Phosphoric Acid, 80% Conc.	A	A	
Phthalic Acid	A	A	
Picric Acid	A	A	
Silicic Acid	A	A	
Sulfuric Acid, < 40% Conc.	B	B	B
Sulfuric Acid, > 40% Conc.	C	C	C
Sulfurous Acid	A	A	
Tannic Acid, 10% Conc.	A	A	
Tartaric Acid	A	A	
Trifluoromethyl Sulfonic Acid	C	C	C

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
ALCOHOLS			
Benzyl Alcohol	A		
Butanol	A		
Cyclohexanol	A		
Ethanol	A	A	
Ethylene Glycol	A	A	B
Ethylene Glycol, 50% Conc.	A	A	A
Glycerol	A		
Gylcols	A	A	
Isopropanol	A		
Methanol	A	A	
Propanol	A		
ALDEHYDES AND KETONES			
Acetaldehyde	A	A	
Acetone	A	A	
Benzaldehyde	A		
Cyclohexanone	A		
Formaldehyde	A	A	
Formalin	A		
Ketones	A		
Methylethyl ketone (MEK)	A	B	C
N-Methyl-2-Pyrrolidone (NMP)	A		
BASES			
Ammonia 880	A		
Ammonia Anhydrous	A	A	A
Ammonia liquid	A	A	A
Ammonium Hydroxide, 10% Conc.	A		
Ammonium Hydroxide, Conc.	A		
Calcium Hydroxide	A		
Hydrazine	A	A	
Hydroxides	A		
Magnesium Hydroxide	A		
Potassium Hydroxide, 10% Conc.	A		
Potassium Hydroxide, 70% Conc.	A		
Sodium Hydroxide, 10% Conc.	A	A	A
Sodium Hydroxide, 50% Conc.	A	A	A
Sodium Hydroxide, Conc.	A		

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
ESTERS			
Aliphatic Esters	A	A	
Amyl Acetate	A	A	
Butyl Acetate	A		
Dibutyl Phthalate	A		
Dimethyl Phthalate	A		
Dioctyl Phthalate	A		
Ethyl Acetate	A		
Oils (Di-Ester and Phosphate Ester Based)	A	A	
ETHERS			
Diethylether	A	A	
Dioxane	A		
Ether	A	A	
Ethylene Oxide (EtO)	A		
Tetrahydrofuran (THF)	A		
HALOGENATED ORGANICS			
1,1,1 Trichloroethane (Genklene)	A		
1,2 Dichloroethane	A		
Carbon Tetrachloride	A	A	
Chorobenzene	A	A	
Chloroform	A	A	
Dibromoethane	A		
Dichlorobenzene	A		
Dichloroethane	A		
Ethylene Dichloride	A		
Freon 11 Trichlorofluoromethane	A		
Freon 113 Trichlorotrifluoroethane	A		
Freon 114 1,1 Dichloro 1,2,2,2 Tetrafluoroethane	A		
Freon 12 Dichlorodifluoromethane	A		
Freon 22 Chlorodifluoromethane	A	A	
Freon 134a	A		
Freon 502	A	A	
Methylene Chloride	A		
Perchloroethylene	A	A	
Trichloroethylene	A	A	

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
HYDROCARBONS			
Acetylene	A	A	
Aromatic Solvents	A	A	
Aviation Hydraulic Fluid	A		
Benzene	A	A	
Brake Fluid (Mineral)	A	A	A
Brake Fluid (Polyglycol)	A	A	A
Butane	A		
Crude Oil	A		
Cyclohexane	A	A	
Diesel Oil	A		
Dowtherm A			C
Dowtherm G			B
Dowtherm HT			B
Dowtherm IF			B
Ethane	A		
Fuel Oil	A		
Gas (Manufactured)	A		
Gas (Natural)	A		
Gasoline	A	A	
Heptane	A		
Hexane	A		
Hydraulic Fluid	A		
Iso-Octane	A		
Kerosene	A		
Lubricating Oil	A		
Methane (Gas)	A	A	A
Motor Oil	A	A	A
Naphtha	A	A	
Naphthalene	A	A	
Oils (Petroleum)	A	A	
Oils (Vegetable)	A	A	
Pentane	A		
Petroleum Ether	A		
Propane	A		
Skydrol Hydraulic Fluid	A		
Styrene (Liquid)	A		
Toluene	A		
Transformer Oil	A	A	
Vaseline	A		

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
INORGANICS			
Aluminum Chloride	A	A	
Aluminum Sulfate	A	A	
Alum, Saturated	A	A	
Ammonium Chloride, 10% Conc.	A	A	
Ammonium Nitrate	A	A	
Antimony Trichloride	A	A	
Barium Salts (Chloride, Sulfide)	A		
Bleach	A	A	
Brine	A	A	
Bromine	C	C	C
Bromine (Dry)	C	C	C
Bromine (Wet)	C	C	C
Bromine Water, Saturated	A	A	
Calcium Bisulfide	A	A	
Calcium Carbonate	A		
Calcium Chloride	A	A	
Calcium Hypochlorite	A	A	
Calcium Nitrate	A		
Calcium Sulfate	A	A	
Carbon Dioxide (Dry)	A		
Carbon Monoxide (Gas)	A	A	A
Chlorine	C	C	C
Copper Acetate	A	A	
Copper Carbonate	A	A	
Copper Chloride	A	A	
Copper Cyanide	A	A	
Copper Fluoride	A	A	
Copper Nitrate	A	A	
Copper Sulfate	A	A	
Cupric Fluoride	A	A	
Cupric Sulfate	A	A	
Cuprous Chloride	A	A	
Ethylene Nitrate	A		
Ferric Chloride	B	B	
Ferric Nitrate	A		
Ferric Oxide	A	A	
Ferric Sulfate	A		
Ferrous Chloride	A		
Ferrous Nitrate	A		

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
INORGANICS			
Ferrous Sulfate	A	A	
Fluorine	C	C	
Hydrogen Peroxide	A	A	
Hydrogen Sulfide (Gas)	A	A	
Iodine	B		
Lead Acetate	A	A	
Lime	A	A	
Magnesium Chloride	A	A	
Magnesium Sulfate	A	A	
Mercuric Chloride	A	A	C
Mercurous Chloride	A		C
Mercury	A	A	C
Nickel Acetate	A	A	
Nickel Chloride	A	A	
Nickel Nitrate	A	A	
Nickel Salts	A		
Nickel Sulfate	A	A	
Nitrogen	A		
Nitrous Oxide	A		
Oxygen	A		
Ozone	A	B	A
Phosphorous Chlorides	A	A	C
Phosphorous Pentoxide	A	A	
Potassium Aluminum Sulfate	A	A	
Potassium Bicarbonate	A		
Potassium Bromide	A	A	
Potassium Carbonate	A		
Potassium Chlorate	A	A	
Potassium Chloride	A	A	
Potassium Dichromate	A		
Potassium Ferricyanide	A		
Potassium Ferrocyanide	A		
Potassium Hydroxide	A	A	
Potassium Nitrate	A	A	
Potassium Permanganate	A		
Potassium Sulfate	A	A	
Potassium Sulfide	A		
Silicone Fluids	A	A	
Silver Nitrate	A	A	

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
INORGANICS			
Sodium Acetate	A		
Sodium Bicarbonate	A		
Sodium Carbonate	A	A	
Sodium Chlorate	A	A	
Sodium Chloride	A	A	
Soldium Hypochlorite	A	A	
Sodium Nitrate	A	A	
Sodium Nitrite	A		
Sodium Peroxide	A	A	
Sodium Salts	A		
Sodium Silicate	A	A	
Sodium Sulfate	A	A	
Sodium Sulfide	A	A	
Sodium Sulfite	A	A	
Sodium (Hot)	C	C	C
Stannic Chloride	A	A	
Stannous Chloride	A	A	
Steam	A	A	A
Sulfites	A	A	
Sulfur	A	A	
Sulfur Chloride	A	A	
Sulfur Dichloride	A	A	
Sulfur Dioxide	A	A	A
Sulfur Hexafluoride (Gas)	A		
Sulfur Trioxide	A	A	
Tar	A		
Tetraethyl Lead	A		
Water, Distilled	A	A	
Water	A	A	A
Water, Sea/Salt	A	A	
Zinc Chloride	A	A	
Zinc Sulfate	A	A	

PEEK CHEMICAL COMPATIBILITY

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Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
MISCELLANEOUS			
Adhesives (not cyanoacrylates)	A		
Apple Juice	A		
Aviation Spirit	A		
Beer	A	A	
Cooking Oil	A		
Creosote	A		
Detergent Solutions (non-phenolic)	A	A	
Edible Fats and Oils	A		
Fatty Acids	A	A	
Fruit Juice	A	A	
Gelatin	A	A	
Ketchup	A		
Linseed Oil	A		
Milk	A	A	
Mineral Oil	A		
Molasses	A	A	
Olive Oil	A	A	
Peanut Oil	A	A	
Paraffin	A	A	
Sewage	A	A	
Soap Solution	A		
Starch	A	A	
Tallow	A	A	
Turpentine	A		
Urea	A	A	
Varnish	A		
Vinegar	A	A	
Wax	A		
White Spirit	A		
Wines and Spirits	A		
Yeast	A	A	

PEEK CHEMICAL COMPATIBILITY

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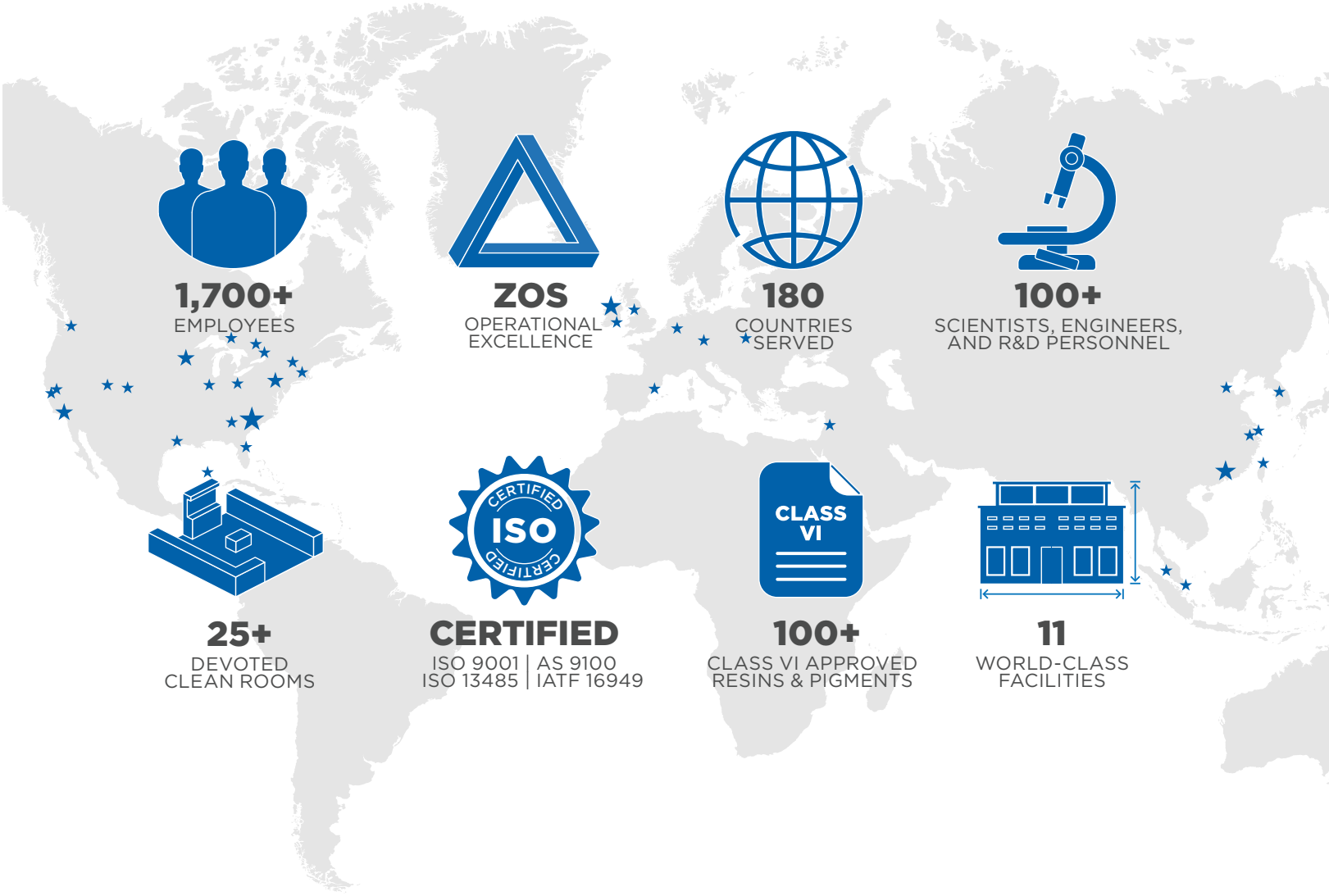
Table 1: PEEK Chemical Compatibility			
Chemical	**23 °C (73.4 °F)**	**100 °C (212 °F)**	**200 °C (392 °C)**
ORGANO-NITROGENS			
Acetonitrile	A		
Aniline	A	B	
Dimethyl Formamide (DMF)	A		
Diethylamine	A		
Nitrobenzene	A		C
Pyridine	A	A	
PHENOLS			
Phenol, Conc.	C	C	C
Phenol, Dilute	A		
SULFUR COMPOUNDS			
Carbon Disulfide	A	A	
Dimethylsulfoxide (DMSO)	B	B	
Diphenylsulfone (DPS)	B	C	C
Ethylene Sulfate	A		

Table 1: Chemical compatibility of PEEK [2]

REFERENCES

1. Bigham, KJ: New Focus on PEEK, RESINATE, Zeus Industrial Products, 2018
2. Victrex: Victrex® PEEK Chemical Resistance, 2016

Get to know Zeus.



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