

Chemical resistance of UHMWPE fiber from DSM Dyneema

UHMWPE fibers are very resistant against chemicals.

UHMWPE fibers from DSM Dyneema are produced from ultrahigh-molecular weight polyethylene. It is highly crystalline and does not contain any chemical groups as aromatic rings, amide, hydroxyl or other that are susceptible to attack by aggressive agents. The result is that UHMWPE fibers are very resistant against chemicals. UHMWPE fibers from DSM Dyneema do not swell, hydrolyze or otherwise degrade in water, seawater or moisture. Properties such as tension fatigue, yarn on yarn abrasion and bending fatigue may improve through contact with water. This is attributed to the cooling or lubricating effect of the water.

The chemical resistance has been analyzed using loss of tensile strength as key indicator. To classify the impact of chemicals the following categories are being used.

Tensile Strength Loss Levels

Impact of Chemicals	Loss of Tensile Strength
None	0-10%
Slight	11-20%
Moderate	21-40%
Appreciable	41-80%
Degraded	81-100%

Tensile Strength & Chemical Exposure

The chemical resistance against various Aviation fluids has been analyzed according to RTCA DO160E Section 11

Chemical	Conditions				Effect on Tensile Strength
	Concentration (%)	Temperature (°C)	Wetting Cycle (hr)	Storage at 65°C (hr)	
Aviation Jet A fuel (ISO 1817 test liquid F)	100	40	24	160	None
Hydraulic fluid (ISO 1817 test liquid 103)	100	70	24	160	None
Lubricating oil (ISO 1817 test liquid 101)	100	70	24	160	None
Solvents and cleaning fluid (Isopropyl alcohol)	100	50	24	160	None
De-icing fluid (Ethylene glycol)	100	50	24	160	None
Insecticide (Pyrethroid pesticide)	100	23	24	160	None
Fire extinguishant (Protein, Fluoroprotein)	100	23	24	160	None

Tensile Strength & Chemical Exposure

Chemical	Conditions			Effect on Tensile Strength
	Concentration (%)	Temperature (°C)	Exposure time (hr)	
Inorganic acids				
Hydrochloric acid	10	20	5000	None
Nitric acid	10	20	5000	None
Sulfuric acid	0.24	60	168	None
Organic acids				
Glacial acetic acid	100	20	5000	None
Alkalis				
Ammonium hydroxide	28	20	5000	None
Calcium hydroxide	0.25	60	168	None
Sodium hydroxide	10	20	5000	None
Strong oxidizing agent				
Kalium permanganate In Sulfuric acid	0.6 25	23	720	Slight
Organic compounds				
Acetone	100	20	5000	None
Ethanol	100	20	5000	None
Oil	100	20	4320	None
	100	40	4320	None
	100	80	4320	None
Petrol	100	20	4320	None
	100	40	4320	None
	100	80	4320	None
Toluene	100	20	5000	None
Trichloromethane	100	20	5000	None
Miscellaneous				
Distilled water	100	0	5000	None
Sea water	100	20	5000	None
Detergent in aqueous solution	30	20	5000	None

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