FEP (unfilled)

General information

Designation

Fluorinated ethylene propylene (Unfilled)

Tradenames

Dyneon

Typical uses

Valves; electrical components and equipment for chemical plant.

Composition overview

Compositional summary

Copolymer of hexafluoropropylene and tetrafluoroethylene

Material family	Plastic (thermoplastic, semi-crystalline)
Base material	FEP (Fluorinated ethylene propylene)
Polymer code	FEP

Composition detail (polymers and natural materials)

Polymer	100			%

Price

Price	* 9.7	-	14.7	USD/lb

Physical properties

Density	0.0766	-	0.0784	lb/in^3

Mechanical properties

Young's modulus	0.0487	-	0.0512	10^6 psi
Yield strength (elastic limit)	* 2.16	-	2.48	ksi
Tensile strength	2.7	-	3.1	ksi
Elongation	250	-	330	% strain
Compressive modulus	* 0.0487	-	0.0512	10^6 psi
Compressive strength	* 2.09	-	2.31	ksi
Flexural modulus	0.0798	-	0.0947	10^6 psi
Flexural strength (modulus of rupture)	* 3.78	-	4.35	ksi
Shear modulus	* 0.0169	-	0.0178	10^6 psi
Bulk modulus	* 0.138	-	0.145	10^6 psi
Poisson's ratio	* 0.432	-	0.45	
Shape factor	3.6			
Hardness - Vickers	* 4.5	-	5.1	HV
Hardness - Rockwell M	* 29	-	31	
Hardness - Rockwell R	40	-	50	
Fatigue strength at 10^7 cycles	* 1.02	-	1.32	ksi
Mechanical loss coefficient (tan delta)	* 0.113	-	0.119	

Impact & fracture properties

Fracture toughness	* 1.35	-	3.8	ksi.in^0.5
Impact strength, notched 23 °C	0.361	-	0.367	BTU/in^2
Impact strength, unnotched 23 °C	* 0.361	-	0.367	BTU/in^2

Thermal properties

Melting point	507	-	547	°F
Glass temperature	* 178	-	205	°F
Heat deflection temperature 0.45MPa	* 246	-	322	°F

Heat deflection temperature 1.8MPa	*	120	-	180	°F
Maximum service temperature		385	-	419	°F
Minimum service temperature		-337	-	-319	°F
Thermal conductivity		0.14	-	0.151	BTU.ft/hr.ft^2.°F
Specific heat capacity		0.241	-	0.251	BTU/lb.°F
Thermal expansion coefficient		46.1	-	58.3	µstrain/°F

Electrical properties

Electrical resistivity		3.3e23	-	3e24	µohm.cm
Dielectric constant (relative permittivity)		2	-	2.2	
Dissipation factor (dielectric loss tangent)		2.85e-4	-	3.15e-4	
Dielectric strength (dielectric breakdown)		500	-	599	V/mil

Optical properties

Refractive index		1.34	-	1.35	
Transparency		Transparent			

Magnetic properties

Magnetic type		Non-magnetic			

Bio-data

RoHS (EU) compliant grades?		✓			
Food contact		Yes			

Absorption & permeability

Water absorption @ 24 hrs		0.005	-	0.01	%
Water vapor transmission		0.101	-	0.244	g.mm/m².day
Permeability (O2)		249	-	303	cc.mil/day.(100.in^2).atm

Processing properties

Polymer injection molding		Limited use			
Polymer extrusion		Limited use			
Polymer thermoforming		Unsuitable			
Linear mold shrinkage		3	-	6	%
Melt temperature		552	-	759	°F
Mold temperature		122	-	392	°F
Molding pressure range		4.99	-	20	ksi

Durability

Water (fresh)		Excellent			
Water (salt)		Excellent			
Weak acids		Excellent			
Strong acids		Excellent			
Weak alkalis		Excellent			
Strong alkalis		Excellent			
Organic solvents		Excellent			
Oxidation at 500C		Unacceptable			
UV radiation (sunlight)		Good			
Flammability		Non-flammable			

Primary production energy, CO2 and water

Embodied energy, primary production	*	9.29e4	-	1.02e5	BTU/lb
CO2 footprint, primary production	*	11.7	-	12.9	lb/lb
NOx creation	*	0.0346	-	0.0382	lb/lb

SOx creation	* 0.104	-	0.115	lb/lb
Water usage	* 1.53e4	-	1.69e4	in^3/lb

Processing energy, CO2 footprint & water

Polymer extrusion energy	* 2.52e3	-	2.79e3	BTU/lb
Polymer extrusion CO2	* 0.44	-	0.486	lb/lb
Polymer extrusion water	* 134	-	201	in^3/lb
Polymer molding energy	* 8.54e3	-	9.44e3	BTU/lb
Polymer molding CO2	* 1.49	-	1.65	lb/lb
Polymer molding water	* 362	-	543	in^3/lb
Coarse machining energy (per unit wt removed)	* 233	-	258	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0407	-	0.0449	lb/lb
Fine machining energy (per unit wt removed)	* 492	-	544	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.0859	-	0.0949	lb/lb
Grinding energy (per unit wt removed)	* 780	-	863	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.136	-	0.15	lb/lb

Recycling and end of life

Recycle	✓			
Embodied energy, recycling	* 3.15e4	-	3.48e4	BTU/lb
CO2 footprint, recycling	* 3.97	-	4.39	lb/lb
Recycle fraction in current supply	0.672	-	0.742	%
Downcycle	✓			
Combust for energy recovery	✗			
Heat of combustion (net)	* 2.01e3	-	2.12e3	BTU/lb
Combustion CO2	* 0.859	-	0.903	lb/lb
Landfill	✓			
Biodegrade	✗			

Recycle mark

Geo-economic data for principal component

Principal component	Fluorocarbon

Links

ProcessUniverse

Producers

Reference

Shape