Fluoropolymer Comparison

Fluoropolymer Comparison - Typical Properties

The values shown represent average experiences from numerous testing sources and are not intended to be specifications.

Mechanical Properties

Property	ASTM Standard	Unit	PTFE	FEP	PFA	ETFE
Specific Gravity	D792	--	2.15	2.15	2.15	1.76
Tensile Strength	D1457 D1708 D638	MPa (psi)	21-34 (3,000-5,000)	23 (3,400)	25 (3,600)	40-46 (5,800-6,700)
Elongation	D1457 D1708 D638	%	300-500	325	300	150-300
Flexural Modulus	D790	MPa (psi)	496 (72,000)	586 (85,000)	586 (85,000)	1,172 (170,000)
Folding Endurance	D2176	(MIT) cycles	$>10^6$	5-80 x 10^3	10-500 x 10^3	10-27 x 10^3
Impact Strength	D256	J/m (ft·lb/in)	189 (3.5)	No Break	No Break	No Break
Hardness	D2240	Shore D pencil	50-65 HB	56 HB	60	72
Coefficient of Friction, Dynamic	D1894	--	0.05-0.10	0.08-0.3	--	0.3-0.4

Thermal Properties

Property	ASTM Standard	Unit	PTFE	FEP	PFA	ETFE
Melting Point	D3418	°C (°F)	327 (621)	260 (500)	306 (582)	267 (512)
Cure Temperature	--	°C (°F)	379-429 (715-805)	360-385 (680-725)	379-399 (715-750)	302-323 (575-615)
Flame Rating*	UL94	--	V0	V0	V0	V0
Limiting Oxygen Index	D2863	%	>95	>95	>95	30-36
Heat of Combustion	D240	MJ/kg (Btu/lb)	5.1 (2,200)	5.1 (2,200)	5.3 (2,300)	13.7 (5,900)

* Statements regarding behavior in a flame situation are not intended to reflect hazards presented by this or any other material when under actual fire conditions.

Chemical Properties

Property	ASTM Standard	Unit	PTFE	FEP	PFA	ETFE
Chemical/Solvent Resistance	D543	--	Excellent	Excellent	Excellent	Excellent
Water Absorption, 24 h	D570	%	<0.01	<0.01	<0.03	<0.03
Salt Spray Resistance (1)	B-117					
-on aluminum		Hours	744+	744+	1000	1000
-on steel		Hours	192	--	--	--
Detergent Resistance (2)	--					
-on aluminum		Hours	264	744	--	--
-on grit-blasted aluminum		Hours	624	600	--	--
-on grit-blasted steel		Hours	24	480	--	--
Weather Resistance	Florida Exposure	Years Unaffected	20	20	10	15

Notes:

1. Salt Spray Resistance: 5% NaCl at 35°C/95°F, hours to failure
2. Detergent Resistance: hours to failure

Electrical Properties

Property	ASTM Standard	Unit	PTFE	FEP	PFA	ETFE
Dielectric Constant	D150	1 MHz	2.1	2.1	2.1	2.6
Dielectic Strength*	D149	V/μm	18	53	80	79
Dissipation Factor	D150	1 MHz	<0.0001	0.0006	0.0001	0.007
Arc Resistance	D495	sec	>300	300	>180	122
Volume Resistivity	D257	ohm·cm	$>10^{18}$	$>10^{18}$	$>10^{18}$	$>10^{17}$
Surface Resistivity	D257	ohm/sq	$>10^{18}$	$>10^{16}$	$>10^{17}$	$>10^{15}$

* Dielectric Strength: 100 micrometers film

Vapor Transmission Rates

Vapor Transmission Rates of FEP Film, 25 µm (1 mil) thickness/per ASTM E-96 (modified)
Values measured on thicker specimens and converted to 25 µm (1 mil)

Vapor	Temperature, °C	g/100 sq in. or g/625 sq cm (24 hr)
Acetic Acid	35	0.41
Acetone	35	0.95
Acetophenone	25	0.50
Benzene	35	0.64
Carbon Tetrachloride	35	0.31
Etyl Acetate	35	0.76
Hexane	35	0.56
Hydrochloric Acid, 20%	25	<0.01
Piperidine	25	0.04
Red Fuming Nitric Acid	25	7.5-1.4
Sodium Hydroxide, 50%	25	<0.01
Sulfuric Acid, 98%	25	0.00001
Water	39.5	0.40