FLUOROPOLYMER SPEC CHART

Property Comparison of Various Fluoropolymers

Property	ASTM test method/test condition	PTFE	PFA	FEP	ETFE	CTFE
Physical Properties						
Specific gravity	D792 D570/24 hrs 1/2"t	2.13~2.22	2.12~2.17	2.12~2.17	1.70~1.76	2.10~2.18
Water absorption (%)		<0.00	<0.03	<0.01	<0.1	<0.00
Mold shrinkage (cm/cm)		0.02 ~0.05	0.04	0.03~0.06	0.03~0.04	0.015~0.020
Contact angle (degree)	Angle to level	110	115	115	96	84
Thermal Properties						
Thermal conductivity (cal/sec/cm)	C177	6 X 10^{-4}	—	6 X 10^{-4}	5.7 X 10^{-4}	4.7~5.3 X 10^{-4}
Coefficient of linear thermal expansion (1/°C)	D696/23~60°C	10 X 10^{-5}	12 X 10^{-5}	8.3~10.5 X 10^{-5}	5~9 X 10^{-5}	4.5 ~ 7.0 X 10^{-5}
Melting point (°C)		327	302~310	270	260	210~212
Melt viscosity (coise)		10^{-11}~10^{-13} (340-380°C)	10^{-4}~10^{-5} (380°C)	4X10^{-4} ~10^{-5} (380°C)	10^{-4}~10^{-5} (300-330°C)	10^{-7} (23°C)
Maximum temp. for continuous use (°C/°F)		260/500	260/500	200/392	150/302	120/248
Mechanical Properties						
Tensile strength (kgf/cm2)	D638/23°C	140~350	280~315	190~220	410~470	320~420
Elongation (%)	D638/23°C	200~400	280~300	250~330	420~440	80~250
Compression strength (kgf/cm2)	D695/1% deformation, 25°C	50~60	50~60	50~60	109	90~120
Tensile modulus (kgf/cm2)	D638/23°C	4,000	—	3,500	5,000~8,000	10,500~21,000
Hexural Modulus (kgf/cm2)	D790/23°C	5,000~6,000	6,600~7,000	5,500~6,500	9,000~14,000	13,000~18,000

Impact strength (ft-lb/ln)	D256/23°C Izod	3.0	—	No breakdown	No breakdown	2.5~2.7
Hardness (Shore)	Durometer	D50~D65	D60	D55	D75	D90
Deformation under load (%)	D621/100°C 70 kfg/cm^2, 24 hrs D621/25°C 140 kgf/cm^2, 24 hrs	5.0 7.0	2.4 2.7	5.0 3.0	5.4 2.3	2.6 0.2
Static friction coefficient	Coated steel surface	0.20	0.50	0.50	0.60	0.80

Electrical Properties

Dielectric constant	D150/10^{3}Hz D150/10^{8}Hz	2.1 2.1	2.1 2.1	2.1 2.1	2.6 2.6	2.3~2.7 2.3~2.5
Dielectric dissipation factor	D150/10^{3}HZ D150/10^{8}HZ	<1 X 10^{-5} 2 X 10^{-5}	1 X 10^{-5} 3 X 10^{-5}	6 X 10^{-5} 5 X 10^{-5}	8 X 10^{-4} 5 X 10^{-3}	(2.3~2.7) X10^{-2} 1 X 10^{-2}
Dielectric breakdown strength (V/ml)	D149/Short time, 1/8 in	480	500	500~600	400	500
Volume resistivity (ohm-cm)	D257	>10^{-18}	>10^{-18}	>10^{-18}	>10^{-18}	>10^{-18}
Chemical resistance		Excellent	Excellent	Excellent	Excellent	Excellent
Weatherability	D2863/Oxygen concentration index	Excellent	Excellent	Excellent	Excellent	Excellent
Combustibility (%)		>95	>95	>95	>31	>95

Typical Filler Properties

Filler	Physical Form	Amount (% Weight)	Effect of Filler
Glass Fibers	Milled Fibers	up to 40% (also in combination with graphite, MoS2 and carbon)	• increased compressive strength • increased rigidity • increased wear resistance • reduced cold flow • resistant to organic solvent
Carbon	Powder	up to 25% (also in combination with graphite, bronze, and glass)	• increased comprehensive strength • increased hardness • increased wear resistance • improved thermal conductivity • good dry running properties
Carbon Fibers	Milled Fibers	up to 30%	• electrically conductive at

			higher filler contents • resistant to hydrofluoric acid
Graphite	Powder	up to 25% (also in combination with glass, bronze, and carbon)	• improved sliding properties • reduced coefficient of friction • improved thermal conductivity
Bronze	Powder	up to 60% (also in combination with carbon, graphite, and MoS2))	• increased comprehensive strength • increased hardness • increased wear resistance • improved thermal conductivity • reduced cold flow
Molybdenum disulphide (MoS2)	Powder	up to 5% (also in combination with glass and bronze)	• improved sliding properties • increased wear resistance
Stainless Steel	Powder	up to 60%	• improved thermal conductivity • reduced cold flow • resistant to most chemicals
Pigments	Powder	up to 2%	• for coloring (identification)