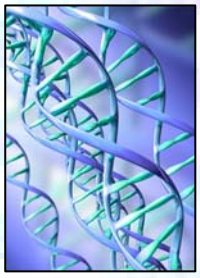


PROFESSIONAL PLASTICS, INC.

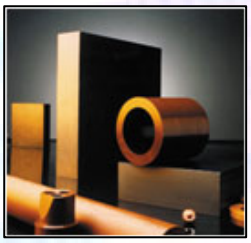
The Nation's Largest Supplier of High-Performance Engineering Materials

High-Performance Plastic Materials Guide

QUADRANT

SAINT-GOBAIN
PERFORMANCE PLASTICS

Polyimide Materials (PI)



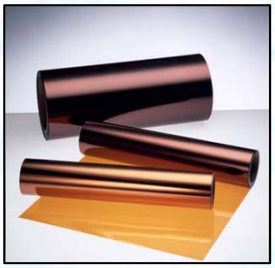
Vespel ® SP-1 Polyimide
Vespel ® SP-1 polyimide offers a combination of temperature resistance, chemical resistance, mechanical toughness, natural lubricity, wear-resistance and insulation properties. This material provides operating temperatures from cryogenic to 300°C (570°F), great plasma resistance, plus a UL rating for minimal electrical and thermal conductivity. Vespel® SP-1 is the unfilled base resin grade. SP-1 provides maximum physical strength, elongation, and toughness as well as the best electrical and thermal insulation values. Vespel in manufactured in plates up to 10" x 10".

Meldin® 7001 Polyimide
A thermosetting polyimide, Meldin® 7001 is made from the unfilled base resin. This grade offers the maximum mechanical properties and high chemical resistance. Meldin® 7001 is ideal for electrical and thermal insulating applications. More ductile than ceramics, and lighter weight than metals. This polyimide material is formed using high-pressure mold presses, automatic resin-feeding systems, and computer-controlled hydraulics. Meldin 7001 series features operational temperatures of up to 600ºF for continuous operation and 900ºF for intermittent exposure, and tight tolerances of ±0.001 in.

Protomid® S1 Polyimide Shapes
Protomid ® polyimide shapes provide superior high-temperature resistance, excellent wear and friction properties, good electrical and physical properties, and chemical inertness. Protomid® polyimide delivers outstanding resistance to creep and lubricated or unlubricated performance, ultra-low outgassing, excellent mechanical strength and impact resistance. Protomid® offers superior tensile strength and flexural modulus of temperature, and due to its outstanding creep resistance at high temperature, applied where very high temperature and excellent wear property is required. Available in direct-formed blanks 3.93" x 3.93" (note: mechanical properties of DF blanks may vary slightly from chart below)

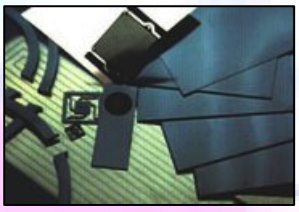
Plavis ESd® - ESd Polyimide
Plavis ESd® (black) is an ESd (electro-static dissipative) polyimide having surface resistivity in the range of 10^6 to 10^9 Ohms/square. PLAVIS-ESd grade prevents electro static charge in the fabrication processing and handling of flat panel glass, semiconductor wafers and other products processed in high-temperature, vacuum or reactive environments. Plavis ESd® is the ONLY commercially available ESd anti-static polyimide shape on the market today. Plavis ESd® - ESd Polyimide Offers: Excellent anti-static properties on surface & ESd resistivity through the molded body. Surface resistivity in the range of 10^6 to 10^9 Ohms/square Excellent machinability. Excellent mechanical strength& thermal resistance. Superior wear resistance.

Plavis-E® Conductive Polyimide
Plavis E ® (black) conductive polyimide shapes are an excellent replacement for Vespel® SP-202. Plavis ® E provides electrical conductivity and thermal resistance for demanding applications. Plavis ® E combines consistent levels of electrical conductivity with a combination of thermal resistance, wear resistance, moisture resistance, toughness, strength and machinability. Plavis ® E parts demonstrate surface resistivity between 10^2 to 10^3 ohms/square. Typical Applications: Pads/stoppers for glass/wafer contact in sputter/CVD chamber, Pads/balls for glass/wafer transfer process, Products that are handled in high-temperature, vacuums or reactive environments.



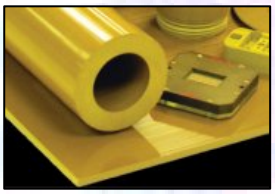
Kapton® Polyimide Film
Kapton film from DuPont has more than 35 years of proven performance as the flexible material of choice in applications involving very high, 400°C (752°F), or very low, -269°C (-452°F) temperature extremes. Kapton polyimide film is used in a wide variety of applications such as substrates for flexible printed circuits, transformer and capacitor insulation and bar code labels. Kapton is also used for wire and cable tapes, formed coil insulation, substrates for flexible printed circuits, motor slot liners, magnet wire insulation, transformer and capacitor insulation, magnetic and pressure-sensitive tapes, and tubing
Kapton® polyimide film possesses a unique combination of properties that make it ideal for a variety of applications in many different industries. The ability of Kapton® to maintain its excellent physical, electrical, and mechanical properties over a wide temperature range has opened new design and application areas to plastic films.

Kaptrex® Polyimide Film
Kaptrex ® Polyimide Film provides similar high performance to Kapton ® film in many applications. Kaptrex provides an excellent balance of electrical, mechanical, thermal, and chemical properties over a wide range of temperatures. It provides excellent electrical properties and resistance to high temperature and radiation. Kaptrex is suitable for insulation of "H" class (180°C or 356°F) electrical machines and appliances under working temperature of 200°C(392°F). Applications: Wire Wrap Insulation & Tapes, Flexible Printed Circuits, Motor Slot Liners, Pressure Sensitive Tapes, Aerospace Shims, Formed Coil Insulation.

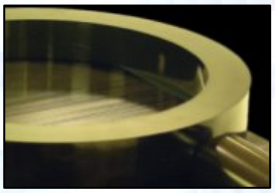


Kaptolam Pro® Laminated Polyimide Film
Kaptolam Pro® is an all-polyimide sheet material that offers material flexibility and an expanded range of thickness options unattainable with cast resins or laminated constructions using adhesives. Offering the excellent chemical, physical, thermal and electrical properties of Kapton® in thick sheet format is unique in today's material marketplace. Traditional laminates are notoriously unreliable at temperatures which exceed the Glass Transition (Tg) of the adhesives used in their constructions. You can count on Kaptolam Pro®'s integrity at extreme temperatures, from cryogenic [-269°C (-452°F)] to as high as 351°C (664°F); and it is readily modified/machined by laser cutting, drilling, machining and chemical etching.

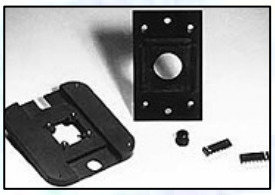
Polyamide-imide Materials (PAI)



Torlon ® 4203
Torlon® 4203 polyamide-imide offers excellent compressive strength and the highest elongation of the Torlon® grades. It also provides electrical insulation and exceptional impact strength. This grade is commonly used for electrical connectors and insulators due to its high dielectric strength. Testing integrated circuits is becoming increasingly complex, as the gaps between the fine wires and pins are incredibly small. Torlon 4203 displays the outstanding strength and dimensional stability to provide extended part life. This materials offers low CTE, high machinability, and excellent wear resistance.

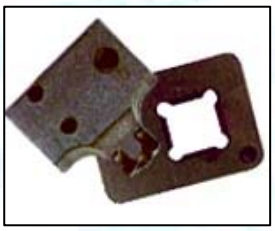


Torlon® 4301
Torlon 4301® Sheets & Rods exhibit excellent wear resistance in bearing grades and is able to endure harsh thermal, chemical and stress conditions. Due to its versatile performance capabilities and proven use in a broad range of applications, Torlon 4301® is a reliable choice. The addition of PTFE and graphite provides higher wear resistance and lower coefficient of friction compared to the unfilled grade. TORLON 4301 PAI also offers excellent dimensional stability over a wide temperature range. This grade excels in severe wear applications such as non-lubricated bearings, seals, bearings cages and reciprocating compressor parts.



Torlon ® 5530
In addition to strength and dimensional stability, Torlon® 5030 is electrically insulative. It has exceptional dielectric strength- over 800-volt/ mil. It offers best- in- class radiation resistance, withstanding exposure to 10 x 9th rads*. Close tolerance components are produced from 5030 for its' excellent dimensional stability. By retaining dimensional stability over a broad temperature range, parts made from Torlon 5530 improve reliability of test connections and extend part life. Torlon 5530 is insulative with a surface resistivity of > 10^{13} Ω/sq

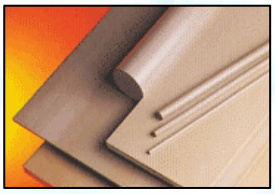
Torlon® 4XG - Extruded (30% G/F)
Torlon 4XG PAI is a 30% glass-reinforced PAI (polyaminde-imide). It offers high rigidity, retention of stiffness, a low expansion rate and improved load carrying capabilities. This grade is well suited for applications in the electrical/electronic, business equipment, aircraft and aerospace industries. Torlon 4XG is the extruded version of Torlon 5030, as made by Quadrant EPP. Torlon 5530 is the compression-molded version of this same product. Both Torlon 4XG and Torlon 5530 are made from a base 30% glass-filled Torlon resin manufactured by Solvay as Torlon 5030 (5030 resin is used for injection-molding).



Semitron® ESd 520HR - ESd PAI
Semitron® ESd 520HR has an industry first combination of electrostatic dissipation (ESd), high strength and heat resistance. This new ESd material is ideal for making nests, sockets and contactors for test equipment and other device handling components. The key features of 520HR are its unique ability to resist dielectric breakdown at high voltages (>100V). Typical carbon fiber enhanced products become irreversibly more conductive when exposed to even moderate voltage.
Semitron ESd520HR has a surface resistivity of 1 X 10^{10} and 1 X 10^{12} Ω/sq

Polyetheretherketone Materials (PEEK)

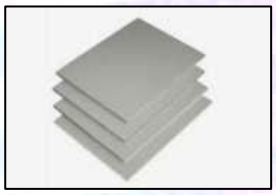
Vestakeep® PEEK
VESTAKEEP® PEEK Resin is a semi-crystalline thermoplastic that can be melt processed by Injection Molding, Compression Molding, and Extrusion. Professional Plastics VESTAKEEP® PEEK Resins for Injection-Molding & Compression Molding. PEEK plastic is best known for the following properties: Chemical & environmental inertness, Heat resistance, High heat deflection temperature, Dimensional stability due to low water absorption, High hardness & abrasion resistance, Good strength at elevated temperatures, Good electrical properties, Good radiation resistance & Inherent flame resistance.



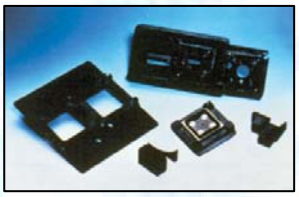
PEEK 450G - Virgin
PEEK is an abbreviation for PolyEtherEther-Ketone, a high performance engineering thermoplastic. PEEK grades offer chemical and water resistance similar to PPS (PolyPhenylene Sulfide), but can operate at higher temperatures. PEEK can be used continuously to 480°F (250°C) and in hot water or steam without permanent loss in physical properties. For hostile environments, PEEK is a high strength alternative to fluoropolymers. PEEK carries a V-0 flammability rating and exhibits very low smoke and toxic gas emission when exposed to flame.

ProtoPEEK® 5025 Bearing Grade PEEK
ProtoPEEK® 5025 is a proprietary, bearing grade PEEK (polyetheretherketone) material, reinforced with carbon fibers and internally lubricated with different proprietary lubricants to improve dry running capabilities. Tribological evaluations under dry running conditions have shown its friction coefficient and wear rate to be much lower than other bearing grade composite materials available in the market. Its extremely low wear rate along with low coefficient of thermal expansion properties make this material an ideal candidate for replacing metal wear components. Especially suited to centrifugal pump components such as impeller/case wear rings, throat bushings, and line shaft bearings. In addition to improved reliability and increased MTBR

(mean time between repair), these features allow for 50% tighter clearance gaps than API recommended values, thereby increasing pump efficiency resulting in substantial savings.



CeramaPEEK ® Ceramic-Filled
CeramaPEEK ® is a proprietary ceramic filled compound created to meet the requirements for tight tolerance, high frequency chip socket test fixtures. Features include: Exceptional dimensional stability: low moisture absorption, low creep, high modulus, metal-like CLTE, low coefficient of hygroscopic expansion. Machinable to very tight tolerances: low burring, compatible with tight pitch and fine diameter holes. Good abrasion resistance and ductility: maintains tolerances after 100,000 chip insertions, good impact properties. Very stable electrical properties: low moisture absorption and intrinsically good electrical insulator. Thermal stability: Compatible with wide temperature range, maintains physicals with after heat aging. CeramaPEEK ® is available in large 24" x 24" (610mm x 610mm) plates and is more economical than competing injection-molded products. – also available in **CeramaPEEK ESd.** Contact us for details.

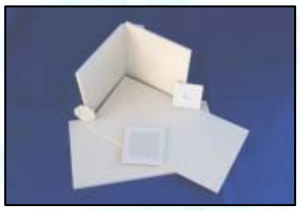


Semitron® ESd 480 ESd PEEK
Semitron® ESd 480 is static-dissipative, carbon fiber reinforced PolyEtherEtherKetone for use where the properties of PEEK are needed, but protection from static discharge is a requirement. This material is available in sheets and rods and is black in color.
Semitron ESd 480 has a surface resistivity of 1 X 10^6 and 1 X 10^9 Ω/sq, but its heat-deflection temperature is 480°F. Its chemical resistance makes it suitable for wafer handling and other structural applications in wet process tools where static dissipation is important. CLTE is 1.7 X 10*–5 in./in./°F

Semitron® ESd 490HR ESd PEEK
Semitron® ESd 490 is a slightly higher temperature PEEK based material that offers similar physical properties as Semitron ESd 480 and a surface resistivity of 1 X 10^9 and 1 X 10^{11} Ω/sq

Polyphenylene-Sulfide Materials (PPS)

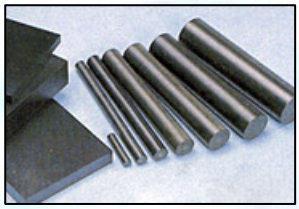
Techtron® PPS
Techtron® PPS offers the broadest resistance to chemicals of any advanced engineering plastic. They have no known solvents below 392°F (200°C) and are inert to steam, strong bases, fuels and acids. Minimal moisture absorption and a very low coefficient of linear thermal expansion, combined with stress-relieving manufacturing, make PPS ideally suited for precise tolerance machined components. Techtron ® PPS rings (as shown) are the industry standard for CMP Retaining rings used in the semiconductor industry.



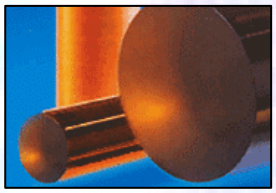
Profine® (specially-filled PPS)
Profine® boasts excellent dimensional stability and is specially designed for precision hole drilling. Producing holes with a diameter of several tens of micron in conventional engineering plastics is associated with various problems caused by the flash, the need for post processing, probe pin errors, and other factors. So far, only a limited number of wholly aromatic polyester resigns could be used for plates and other parts requiring ultra fine holes. Special resin treatment and proprietary molding technology make Profine is a super engineering plastic that largely eliminates flash related problems during precision machining. Consequently, there is now a wider choice of materials for applications requiring ultra-fine precision holes.

Ryton® - PPS - 40% Glass-Filled
Ryton polyphenylene sulfide (PPS) has a long standing reputation as a high performance engineering thermoplastic. With an exceptional degree of inherent thermal stability, dimensional stability, chemical resistance, and flame resistance, combined with excellent mechanical and electrical properties, Ryton PPS can provide superior performance over a broad range of critical design requirements. Ryton also possesses excellent processing characteristics necessary to meet demanding, high precision applications.

Polybenzimidazole (PBI)

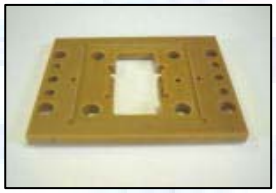


Celazole® PBI
Celazole PBI offers the highest heat resistance and mechanical property retention over 400°F of any unfilled plastic. It has better wear resistance and load carrying capabilities at extreme temperatures than any other reinforced or unreinforced engineering plastic. As an unreinforced material, Celazole PBI is very "clean" in terms of ionic impurity and it does not outgas (except water). Celazole PBI has excellent ultrasonic transparency which makes it an ideal choice for parts such as probe tip lenses in ultrasonic measuring equipment. Celazole PBI is also an excellent thermal insulator. Other plastics in melt do not stick to PBI. These characteristics make it ideal for contact seals and insulator bushings in plastic production and molding equipment. Features: Highest mechanical properties of any plastic above 400°F (204°C), Highest heat deflection temperature 800°F (427°C), with a continuous service capability of 750°F (399°C) in inert environments, or 650°F (343°C) in air with short term exposure potential to 1,000°F (538°C), Lowest coefficient of thermal expansion and highest compressive strength of all unfilled plastics.

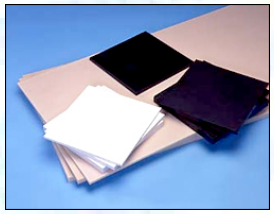


Polyetherimide Materials (PEI)

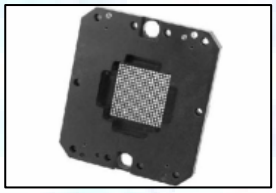
Ultem ® 1000 Polyetherimide
Ultem® 1000 (standard, unfilled polyetherimide) offers excellent chemical resistance, high dielectric strength, natural flame resistance, and extremely low smoke generation. Ultem's® exceptionally high mechanical properties and ease of fabrication including bonding make it an easy choice when exceptional performance is required. Suface resistivity is > 10^{13} Ω/sq.



Ultem® 2300 - 30% Glass-Filled
Ultem® 2300 PEI is an extruded 30% glass reinforced polyetherimide. It is an amorphous, high-performance polymer with exceptional flame and heat resistance. It performs continuously to 340°F (171°C), making it ideal for high strength/high heat applications, and those requiring consistent dielectric properties over a wide frequency range. It is hydrolysis resistant, highly resistant to acidic solutions and capable of withstanding multiple autoclaving cycles. Ultem® 2300 provides greater rigidity and improved dimensional stability while maintaining many of the useful characteristics of unfilled Ultem.

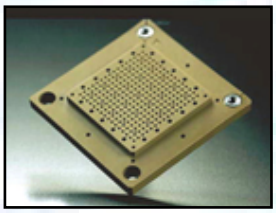


Semitron ® ESd 410C - Conductive Ultem ®
Semitron ESd 410C (black) – static dissipative/conductive PEI. Having an excellent mechanical performance up to 210°C, Semitron ESd 410 provides ESd- solutions at higher temperatures. This material has a surface resistivity of 1 X 10^4 and 1 X 10^6 Ω/sq. Additionally, Semitron ESd 410 exhibits excellent dimensional stability (low coefficient of linear thermal expansion and small water absorption), ideal for handling equipment in the electrical/electronic or semiconductor industries. Semitron ESd 410C is conductive with a surface resistivity of 10^4 1 - 10^6 Ω/sq



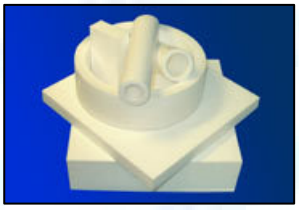
Semitron® ESd 420 - ESd PEI (Ultem)
Semitron® ESd 420 - Static Dissipative PEI is the only, truly dissipative plastic product for use in high temperature applications. ESd 420 has a unique combination of properties: static dissipation, low coefficient of expansion, high strength and heat resistance and is non-sloughing. ESd 420 has a tensile modulus of 550,000 psi, a heat deflection temperature (at 264 psi) of 420°F, and a surface resistivity in the intermediate range of 1 X 10^6 and 1 X 10^9 Ω/sq. Semitron® ESd 420 is also ideal for use in equipment for handling components in the hard-drive manufacturing and assembly processes. Also available in **Semitron® ESd 420v - ESd PEI (Ultem)** resistivity target range of 1 X 10^6 and 1 X 10^9 Ω/sq. Unlike crystalline materials in which the CLTE rises two to threefold at the glass-transition temperature, Semitron ESd 420V maintains its low CLTE to over 400°F. This is a significant advantage in maintaining dimensional stability and mechanical strength of a test socket throughout the full test temperature range.

Wholly-Aromatic Polyester

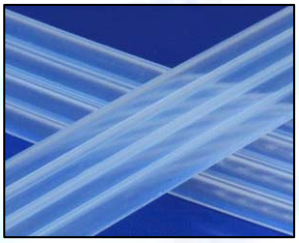


Sumika Super S1000
Sumika Sumika Super S1000 is a wholly aromatic polyester material that offers high temperature performance and dimensional stability. This material is commonly used for PolyBGA adapters used for testing of integrated circuits. S1000 has an operational temperature of 260° C and thermal resistance far exceeding that of other conventional engineering plastics. This material will not melt down or deform its shape even at 400° C. It is easy to process (milling, drilling) and it is a suitable material for manufacturing parts requiring tight tolerances. Sumika S1000 has a moisture resistance ten times greater than polyimide. It maintains dimensional stability even when exposed to moisture.

Fluoropolymers



Teflon PTFE
Teflon® PTFE exhibits astonishing chemical resistance and ultra high-purity. Self-lubricating and with a low friction coefficient, Teflon PTFE (polytetrafluoroethylene) sheets and rods are ideally suited for the manufacture of high-temperature seals, insulators and bearings used in semiconductor, aerospace & chemical processing industries. Features: Lowest coefficient of friction of any known material. Operates continuously at up to 500F. Tremendous chemical resistance. Excellent insulating properties. Limitations: low compressive & tensile strength.



FEP (Fluorinated Ethylene Propylene)
FEP is a relatively soft thermoplastic with lower tensile strength, wear resistance, and creep resistance than many other engineering plastics. However, FEP is chemically inert and has a low dielectric constant over a wide frequency range. FEP possesses a very high degree of stress crack resistance, a low coefficient of friction, exceptional dielectric properties, heat resistance, retention of properties after service at 400°F (204°C) with useful properties at -454°F (-270°C), and meets FDA 21CFR.177.1550. FEP has high transparency (with good transmittance of UltraViolet and visible wavelengths.) FEP offers the lowest refractive index of all thermoplastics with low light reflection (the same as water.)

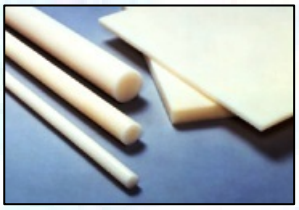
PFA (PerFluoroAlkoxy)
PFA offers similar properties to FEP, but is is preferred when extended service is required in hostile environments involving chemical, thermal, and mechanical stress. PFA offers high melt strength, stability at high processing temperatures, excellent crack and stress resistance, a low coefficient of friction, and more than 10 times the Flex life of FEP. It has high resistance to creep and retention of properties after service at 500°F (260°C), with useful properties at -320°F (95°C). PFA also meets FDA 21CFR.177.1550.

Rulon® LR (Maroon)

Rulon® LR is a maroon colored bearing material best known for its versatile design properties. Rulon LR is compatible with most hardened steel substrates. Mild steel is acceptable; harder running surfaces are better. Rulon® has a practically universal chemical inertness. Of the chemicals encountered in commercial practice, only molten sodium and fluorine, at elevated temperatures and pressures, show any signs of attack.
Other Rulon® Grades Include: Rulon J, 641, AR, 142, W2 & more than a dozen more.

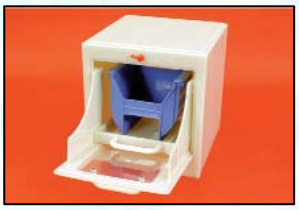
Kel-F® - PCTFE

Kel-F - PCTFE (PolyChloroTriFluoroEthylene) Kel F is a fluorocarbon-based polymer and is commonly abbreviated PCTFE. PCTFE offers the unique combination of physical and mechanical properties, nonflammability, chemical resistance, near zero moisture absorption, and excellent electrical properties. These characteristics cannot be found in any other thermoplastic fluoropolymer with a useful temperature range of -400°F to +400°F. PCTFE also has extremely low outgassing, making it well suited for use in aerospace and flight applications. Note: Kel-F® is a registered tradename of 3M Company. In 1996, 3M discontinued manufacturing of Kel-F & today, all PCTFE resin is manufactured by Daikin under the tradename of Neoflon ® or by Allied Signal under the tradename of Aclon ®. Kel-F is still the most commonly used tradename used to describe PCTFE.



Kynar® 740 PVDF

Kynar® 740, an engineering thermoplastic that offers the stable characteristics of a fluoropolymer, as well as mechanical strength, abrasion resistance and high purity. PVDF also offers excellent chemical resistance, UV radiation resistance and low permeability. These shapes are stocked in rigid material, but are available in other resins on a custom basis. PVDF can be used in the semiconductor, pulp and paper, and pharmaceutical industries, as well as for nuclear waste, and chemical and food processing.



Halar® - ECTFE

Halar ECTFE is a partially fluorinated semi-crystalline polymer offering a unique combination of mechanical properties, thermal and chemical resistance with an outstanding ease of processability. Halar ECTFE, a copolymer of ethylene and chlorotrifluoroethylene, can bring advantages to the end user when compared to other fluoropolymers. It is a very versatile polymer, available in all forms to meet processing needs. Halar offers excellent resistance to abrasion, harsh chemicals, and permeation.

Comparative Data Sheets

Property	Units	Test Method ASTM	Vespel ® SP-1 Polyimide	Meldin® 7001 Polyimide	Protomid® S1 Polyimide	Sumika Super S1000	Torlon ® 4203	Torlon ® 5530
Specific Gravity	g/cm^3	D-792	1.43	1.43	1.41	1.35	1.41	1.61
Tensile Strength, 73 F	psi	D-638	12,500	12,500	13,300	9,964	18,000	15,000
Tensile Modulus of Elasticity, 73 F	psi	D-638	-	-	-	-	600,000	900,000
Tensile Elongation, 73 F	%	D-638	7.5	7.5	7.5	8.0	10	3.0
Flexural Strength 73 F	psi	D-790	15,900	15,900	18,200	14,500	24,000	20,000
Flexural Modulus of Elasticity, 73 F	psi	D-790	450,000	450,000	458,000	469,922	600,000	850,000
Shear Strength, 73 F	psi	D-732	13,000	13,000	13,100	-	16,000	-
Compressive Strength	psi	D-695	19,300	19,300	-	20,885	24,000	27,000
Compressive Modulus of Elasticity, 73 F	psi	D-695	350,000	350,000	352,000	-	478,000	600,000
Hardness, Rockwell, 73 F	-	D-785	E45-60	E45-60	M85-100	-	E80 (M120)	E85 (M125)
Coefficient of Linear Thermal Expansion	In/in/ F	D-696	5.1×10^{-5}	5.1×10^{-5}	5.6×10^{-5}	5.1×10^{-5}	1.7×10^{-5}	2.6×10^{-5}
Deflection Temperature 264 psi	F	D-648	680	680	680	572	532	520
Melting Point	F	D-789	No melt	No melt	No Melt	No Melt	n/a	n/a
Continuous Service Temp. in Air (Maximum)	F	-	550	550	550	500	500	500
Dielectric Strength, Short Term	V/mil	D-149	560	560	560	458	580	700
Dielectric Constant, 60 Hz	-	D-150	-	-	-	-	-	-
10 Hz	-	D-150	-	-	-	-	-	-
10x6 Hz	-		3.55	3.55	2.91	-	4.2	6.3
Water Absorbtion – 24 hrs	%	D-570	0.24	0.24	-	0.04	0.4	0.3
- Saturation	%	D-570	0.72	0.72	0.95	-	1.7	1.5
Surface Resistivity at 50% RH	Ohm s/sq	D-257	10^{14}- 10^{15} Ω/sq	10^{14}- 10^{15} Ω/sq	10^{14}- 10^{15} Ω/sq	10^{14} Ω/sq	> 10^{16} Ω/sq	> 10^{13} Ω/sq

Property	Units	Test Method ASTM	Profine ® Specially Filled PPS	Semitron ® ESd 410C ESd PEI	Semitron® ESd 420 ESd PEI	Semitron® ESd 480 ESd PEEK	Semitron® ESd 490HR ESd PEEK	Semitron® ESd 520HR ESd PAI
Specific Gravity	g/cm^3	D-792	-	1.41	1.34	1.47	1.50	1.58
Tensile Strength, 73 °F	psi	D-638	5,888	9,000	11,500	14,500	14,000	12,000
Tensile Modulus of Elasticity, 73 F	psi	D-638	-	850,000	640,000	940,000	940,000	800,000
Tensile Elongation, 73 °F	%	D-638	0.8	2.0	2.0	1.5	2.3	3.0
Flexural Strength 73 °F	psi	D-790	11,748	12,000	14,500	21,000	21,000	20,000
Flexural Modulus of Elasticity, 73 F	psi	D-790	1,582,361	850,000	650,000	1,000,000	950,000	850,000
Shear Strength, 73 °F	psi	D-732	-	9,000	8,020	-	-	12,600
Compressive Strength	psi	D-695	-	19,500	23,800	26,500	26,000	30,000
Compressive Modulus of Elasticity, 73 F	psi	D-695	-	600,000	370,000	570,000	600,000	600,000
Hardness, Rockwell, 73 F	-	D-785	R114	M115 (R125)	M118	M107 (R122)	M105 (R123)	M108
Coefficient of Linear Thermal Expansion	In/in/ F	D-696	3.5×10^{-5}	1.8×10^{-5}	1.95×10^{-5}	1.7×10^{-5}	2.8×10^{-5}	2.8×10^{-5}
Deflection Temperature 264 psi	°F	D-648	347	410	410	500	500	520
Melting Point (crystalline) peak	°F	D-789	532	N/A	N/A	644	644	N/A
Continuous Service Temp. in Air (Maximum)	°F	-	-	338	340	475	475	500
Dielectric Strength, Short Term	V/mil	D-149	-	N/A	-	-	-	475
Dielectric Constant, 10^6 Hz	-	D-150	5.1	3.0	5.63	-	<2 sec	5.76
Water Absorbtion – 24 hrs	%	D-570	0.02	0.3	0.5	0.18	0.18	0.6
- Saturation	%	D-570	-	1.1	2.9	1.65	1.65	4.6
Surface Resistivity at 50% RH	Ohms/ sq	D-257	-	10^4 1 - 10^6 Ω/sq	10^6- 10^9 Ω/sq	10^6- 10^9 Ω/sq	10^9- 10^{11} Ω/sq	10^{10}- 10^{12} Ω/sq

Property	Units	Test Method ASTM	PEEK - Virgin	CeramaPEEK ® Ceramic-filled PEEK	Techtron ® PPS	Ultem ® 1000 Unfilled PEI	Ultem ® 2300 30% GF PEI
Specific Gravity	g/cm^3	D-792	1.32	1.51	1.35	1.27	1.51
Tensile Strength, 73 °F	psi	D-638	14,500	13,000	13,500	15.2	17,000
Tensile Modulus of Elasticity, 73 F	psi	D-638	490,000	650,000	500,000	430,000	800,000
Tensile Elongation, 73 °F	%	D-638	50	-	15	60	3
Flexural Strength 73 °F	psi	D-790	24,600	23,000	21,000	21,000	30,000
Flexural Modulus of Elasticity, 73 °F	psi	D-790	590,000	650,000	575,000	480,000	900,000
Shear Strength, 73 °F	psi	D-732	7,690	-	9,000	15,000	-
Compressive Strength	psi	D-695	20,000	17,000	21,500	20,300	32,000
Compressive Modulus of Elasticity, 73 °F	psi	D-695	450,000	-	430,000	420,000	620,000
Hardness, Rockwell, 73 °F	-	D-785	R126	-	M95 (R125)	M109	M114 (R127)
Coefficient of Linear Thermal Expansion	In/in/ F	D-696	2.6×10^{-5}	2.0×10^{-5}	2.8×10^{-5}	3.45×10^{-5}	1.1×10^{-5}
Deflection Temperature 264 psi 66 psi	°F °F	D-648 D-648	320 -	> 500	250 -	392 410	410
Melting Point	°F	D-789	640	-	540	-	-
Continuous Service Temp. in Air (Maximum)	°F	-	480	-	425	340	340
Dielectric Strength, Short Term	V/mil	D-149	480	400	540	830	770
Dielectric Constant, 60 Hz	-	D-150	3.2	-	-	3.15	-
10 Hz	-	D-150	-	-	-	3.15	-
10x6 Hz	-		3.3	3.5	3.0	-	3.7
Water Absorbtion – 24 hrs	%	D-570	0.15	0.2	0.01	0.25	-
- Saturation	%	D-570	0.50	-	0.03	1.25	-
Surface Resistivity at 50% RH	Ohms /sq	D-257	> 10^{13} Ω/sq	> 10^{13} Ω/sq	> 10^{13} Ω/sq	> 10^{13} Ω/sq	3 x 10^{16} Ω/sq

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