DuPont™ ETFE Coatings versus ECTFE Fluoropolymer Resin

Industrial Nonstick Coatings

Product Information

Comparison of ETFE and ECTFE Fluoropolymer Resins

Electrical Properties

Both are good electrical insulators. They have similar nominal values for:

- Low Dielectric Constant
- High Dielectric Strength
- Low Dissipation Factors over a wide range of frequencies
- High Volume and Surface Resistivities

Thermal Properties

Both have high use temperatures. They have similar nominal values for:

- Maximum Service Temperature 302 °F (150 °C),
- Coefficient of Linear Thermal Expansion
- Deflection Temperature
- Thermal Conductivity

ETFE Thermal Advantages:

- Higher Melting Point

  The melting point of ETFE, 500 °F (260 °C), is higher than ECTFE, 473 °F (245 °C), ETFE thus provides a higher margin of safety in the event of an accident (for example, a "run-away" chemical reaction that could develop temperatures much higher than normal).
- Higher Thermal Stability
- Lower Low Temperature Embrittlement

ETFE is More Thermally Stable than ECTFE

Chemical Properties

ETFE is affected by strong oxidizing acids, strong organic bases and sulfonic acids at elevated temperatures.

ECTFE is affected by acids, bases and halogens at elevated temperatures, is attacked by amines, esters, and ketones, and is plasticized by halogenated solvents.

ETFE is More Chemically Resistant than ECTFE…
In Virtually All Classes of Compounds
At Higher Temperatures

SUMMARY

ETFE and ECTFE polymers are both used commercially as the base resins for thick film coatings used in the Chemical Processing Industry. ETFE has better chemical resistance and higher temperature resistance, as determined empirically and supported by a sound basis in chemical principles. These primary advantages not only provide an extra margin of performance in chemical service, but also contribute to a more reliable application process and improved quality of the final coating.

For more information on
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Item	Unit	Method	ETFE	ECTFE	PVdF	FEP	PTFE
Mechanical properties							
Specific gravity	-	ASTM D792	1.74	1.69	1.77	2.16	2.1
Melt velocity	Pa·s	-	10^3		10^3	10^3	-
Tensile strength	MPa	ASTM D638	48	41	55	20	22
Tensile elongation	%	ASTM D638	430	250	250	280	380
Tensile modulus	MPa	ASTM D638	800	1650	970	350	400
Flex modulus	MPa	ASTM D790	900	670	1550	610	520
Izod impact	J/m	ASTM D256	non-breakable	non-breakable	250	non-breakable	160
Rockwell hardness	-	ASTM D785	50	93	110	25	18
Durometer D hardness	-	ASTM D785	67	-	-	55	58
Friction coefficient	-	-	0.20	-	0.21	0.20	0.09
Thermal Properties							
Melting point	°C	-	260	245	180	290	327
Linear thermal expansion coefficient	10^{-5}/°C	ASTM D696	9.4		12.8	10.5	10.0
Flammability	-	UL-94	V-0	V-0	V-0	V-0	V-0
Continuous service temperature	°C		150	150	150	200	260
Chemical Properties							
Water absorption	%	ASTM D570	0.03	0.01	0.05	0.01	0.01
Chemical resistance	-	ASTM D543	excellent	good	good	excellent	excellent
Gas permeation		ASTM D1434					
– O_2			3.1		1.8	12	21
– N_2			1.0		0.1	3.2	7.9
Electrical Properties							
Volume specific resistance	(V·cm)/A	ASTM D257	10^{17}	10^{18}	$2*10^{14}$	10^{18}	10^{18}
Dielectric constant	-	ASTM D150	2.6	2.6	6.4	2.1	2.1
Dielectric tangent	-	ASTM D150					
60Hz			0.0006	0.0006	0.05	0.0003	0.0001>
1kHz			0.0008	0.0015	0.018	0.0002	0.0001>
1MHz			0.005	0.015	0.16	0.0007	0.0001>
Break-down voltage	kV/0.1mm	ASTM D149	12	12	9	12	9
Arc resistance	s	ASTM D495	120	18	60	165	300

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