

Progetto di ricerca di interesse nazionale 2005, Cofinanziato dal MIUR

Titolo generale della ricerca:



PERCORSI E GESTIONE DELLE INFORMAZIONI TECNICHE PER LA PROMOZIONE E IL CONTROLLO DELL'INNOVAZIONE NEI MATERIALI E NEL PROGETTO DI ARCHITETTURA

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Materiale di base

SELEZIONE DI SCHEDE TECNICHE DAI PRINCIPALI PRODUTTORI

I dati pubblicati nelle schede sono stati forniti dalle aziende e sono indicativi. Per una corretta e più aggiornata informazione si consiglia il contatto diretto con i loro uffici commerciali.

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ETFE (FLUON)

A Fluoropolymer for the next Age

Fluon®ETFE is a thermoplastic fluoropolymer developed by Asahi Glass. It is a copolymer comprising of tetrafluoroethylene (C₂F₄) and ethylene (C₂H₄). Fluon®ETFE is a balanced fluoropolymer that has chemical resistance and electrical properties comparable to typical fluoropolymer, such as PTFE, PFA and FEP and also is more progressive than ECTFE or PVdF with its improved mechanical strength and very easy moldability.

We are convinced that Fluon®ETFE offers customers the best solution, such as cost reduction compared to the use of other fluoropolymers, or shifting from conventional materials.

Main use of Fluon®ETFE

Extrusion molding	electric cables	films
	tubes	filament
Injection molding	casing	other various shaped molding
Powder coating or Lining		

Good Moldability

With the characteristics of fluoropolymers, extrusion molding, injection molding and powder coating are available, as with general thermoplastic resins. Filming, heat-sealing, composition with rubber and various secondary processes are possible.

Good Performance Over a Wide Range of Temperatures

Stable mechanical electrical properties are maintained over a wide range of temperatures, -200 - +180°C. Continuous service at 180°C is possible.

Excellent Chemical Resistance

Almost all chemicals, from hard acids and hard bases down, will not affect the properties of Fluon®ETFE.

Exceptionally Good Electrical Properties

Fluon®ETFE is an excellent insulator and has a high break-down voltage with thin film. A low dielectric constant dielectric tangent would be evident over a wide range of frequencies.

Nonflammable, Non-poisonous

Flammability: UL-94V-0. Tasteless, odorless, non-poisonous and suitable for almost any purpose.

Good weatherability beyond 10 years

Screens ultraviolet-rays (UV) and does not deteriorated as a result of contact with UV.

Excellent Low Surface Energy

Good surface properties, e.g. low friction constant, anti-adhesion and water/oil repellency give the lowest of flow resistance.

Fluon®ETFE Properties

Item	Unit	Method	Fluon®ETFE	ECTFE	PVdF	FEP	Fluon®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	2)	180	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 ³⁾	3)	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

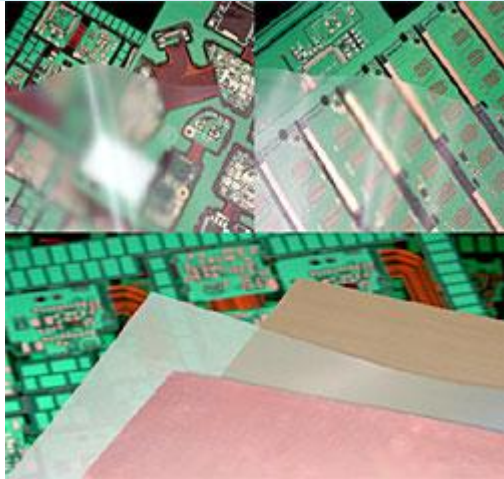
1):0.69Mpa, 3m/min, against stainless steel

2):Reduced to half after 100,000 hours

3):10⁻¹⁴mol·m/(s·m²·Pa)

ETFE – FILM APPLICATIONS

Electronics



Release film for fabrication of electric devices

Fluon®ETFE Film can be used at high temperatures over 200°C. It can stop resin overflowing and has high tensile and tear strength. It does not contaminate copper surface or separator plates

Heat resistance	Chemical resistance	Non-flammability
Non-stick	Electrical Properties	Mechanical strength

Energy



Protective film for solar cells

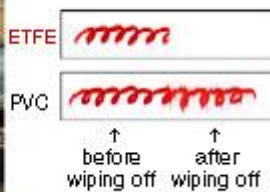
Fluon®ETFE Film offers high durability. After more than 10 years' exposure, degradation of light transmittance and mechanical properties are very low. Fluon®ETFE Film is not torn easily even if scratched, due to the excellent mechanical properties.

Durability	Transparency
Non-flammability	

Wallpaper



Comparison of ease of wiping off ink

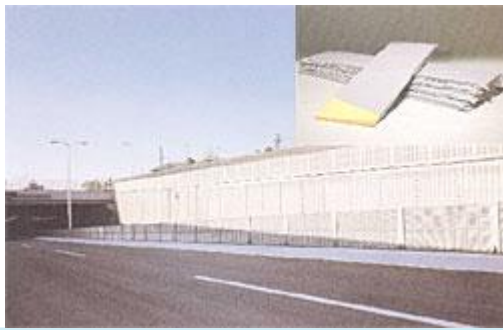


Lamination film for kitchen range hoods, wall paper and other household applications.

Dirt can easily be removed by simply wiping the surface of Fluon®ETFE Film.

Heat resistance	Chemical resistance
Durability	Non-flammability
Non-stick	

Sound suppression wall for highways



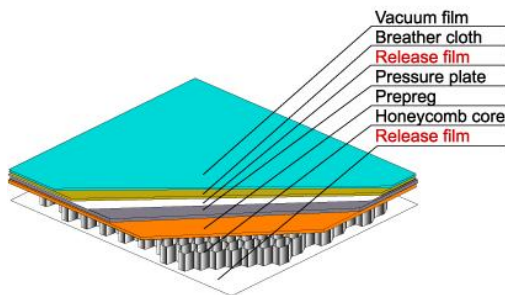
Protection film for noise absorbers

Fluon®ETFE Film offers high durability so it is ideal for outdoor use over very long period of time. Fluon®ETFE Film can protect and prolong the life of glass wool.

Durability

Non-flammability

Aviation & space



Release film for FRP

Fluon®ETFE Film offers excellent heat resistance, so that Fluon®ETFE Film is ideal suited to the application of release film for FRP.

Heat resistance

Non-flammability

Non-stick

Test	Unit	ASTM	Fluon®ETFE Film
Mechanical Properties			
Specific gravity	-	ASTM D792	1.75
Tensile Strength	MPa	JIS K7127	over 39
Tensile Elongation	%	JIS K7127	200-510
Thermal Properties			
Melting Point	°C	-	260
Linear Thermal Expansion Coefficient	10 ⁻⁵ /°C	ASTM D696	9.4
Flammability	-	-	Non-flammability
Continuous service temperature	°C		150-180
Chemical Properties			
Water absorption(23°C, 24hrs)	%	ASTM D570	0.03
Chemical resistance	-	ASTM D543	excellent
Electrical Properties			
Volume specific resistance	Ω·cm	ASTM D257	10 ¹⁷
Dielectric constant (23°C, 1MHz)	-	ASTM D150	2.6
Dielectric tangent	-	ASTM D150	
60Hz			0.0006
1kHz			0.0008
1MHz			0.005
1GHz			0.01
Break-downvoltage	kV/0.1mm	ASTM D149	12
Air resistance	s	ASTM D495	120

F-CLEAN (FILM PER COPERTURA DI SERRE)

Test	Unit	ASTM	F-CLEAN®
Mechanical Properties			
Specific gravity	-	ASTM D792	1.75
Tensile Strength	MPa	JIS 7127	over 39
Tensile Elongation	%	JIS 7127	200-510
Thermal Properties			
Melting Point	°C	-	260
Linear Thermal Expansion Coefficient	10 ⁻⁵ /°C	ASTM D696	9.4
Flammability	-	-	Non-flammability
Continuous service temperature	°C		150-180
Chemical Properties			
Water absorption(23°C,24hrs)	%	ASTM D570	0.03
Chemical resistance	-	ASTM D543	excellent
Electrical Properties			
Volume specific resistance	°·cm	ASTM D257	10 ¹⁷
Dielectric constant(23°C,1MHz)	-	ASTM D150	2.6
Dielectric tangent	-	ASTM D150	
60Hz			0.0006
1kHz			0.0008
1MHz			0.005
1GHz			0.01
Break-downvoltage	kV/0.1mm	ASTM D149	12
Air resistance	s	ASTM D495	120