



Shin-Etsu Film

Polypropylene Capacitor Film

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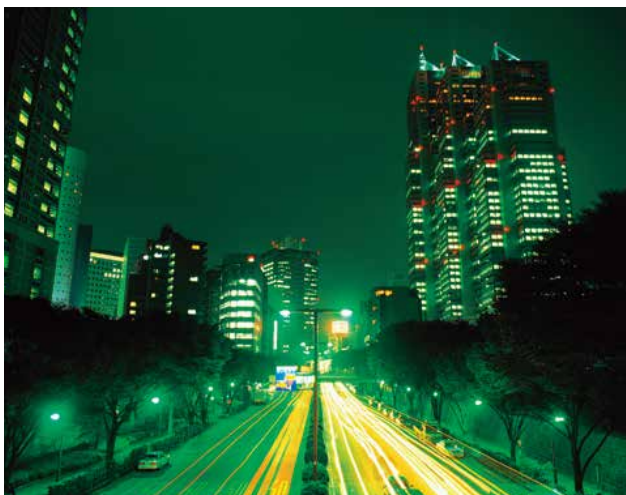


Polypropylene Capacitor Film Shin-Etsu PP Films

Shin-Etsu PP film is hazy polypropylene film for capacitor use that was first developed globally for commercial purposes. With our unified management system, encompassing all steps from raw material procurement through to production and shipping, we offer stable supply to our customers. We use carefully selected high-purity polypropylene resin and an inflation process in the simultaneous biaxial orientation production method. It has excellent characteristics for dielectric film. One major feature is the network structure of evenly distributed irregularities on film surface. This structure facilitates oil penetration of film surface and improves efficiency of insulating oil impregnation of capacitor

elements. This network structure was created with proprietary Shin-Etsu technology that makes use of the crystalline transformation behavior of polypropylene, unlike products manufactured with processing additives or secondary surface processing. Our film offers consistent quality and the high reliability required of capacitor materials.

Thanks to its superior oil-impregnability, Shin-Etsu PP film enables the production of today's all-film type capacitors that do not use capacitor paper. Shin-Etsu has also earned high acclaim for its contribution to greater reliability, higher capacity, and miniaturization of power capacitors.



■ Features

1. Diverse variety

The physical and electrical properties of polypropylene film after impregnation with insulating oil vary according to the type of insulating oil used and the impregnation conditions and other conditions of the capacitor production process. Therefore, the required properties of PP film will differ according to the capacitor production conditions and design concept.

Shin-Etsu Film's product lineup includes the standard R Type, and RH Type and LR Type, whose properties differ from those of R Type. We have a system in place to offer the optimum products tailored to diverse customer needs.

2. A comprehensive evaluation system

We have facilities to evaluate various properties of capacitor film.

In order to maintain the highest standard of quality, results of evaluation have been reflected promptly to production.

■ Product Type

Type	Feature	Application	Voltage
R	Standard type	For all-PP capacitors	high- and extra-high-voltage
RH	Low heat-shrink type		
LR	Low space factor type		
S	Plain type	For PP-CP capacitors	high- and extra-high-voltage
CRA	Hazy surface corona treatment	Metallized film capacitors	low- and high-voltage
CRB	Smooth surface corona treatment		

■ Thickness

Item	Nominal Thickness (μm)																	
	7.4	8.3	9.0	10.0	11.0	11.2	11.8	12.7	13.6	14.0	14.5	15.2	16.3	17.8	18.2	20.0	22.7	27.3
tw	7.4	8.3	9.0	10.0	11.0	11.2	11.8	12.7	13.6	14.0	14.5	15.2	16.3	17.8	18.2	20.0	22.7	27.3
tm	7.9	9	10	11	12	12.2	13	14	15	15.4	16	16.5	18	19.5	20	22	25	30

tw: thickness by weight method

tm: thickness by micrometer method

■ Roll Dimensions

Item	Dimension	
I.D.*1	76.0±1.0 mm	
O.D.*2	210 mm, 250 mm, 300 mm, max 500 mm	
Film width (tolerance)	30–200 mm (±0.3 mm)	202–1,400 mm (-0, +1.0 mm)

*1 I.D.: inner diameter of core

*2 O.D.: outer diameter of roll

■ Shin-Etsu POLYPROPYLENE FILM R-TYPE (Typical Properties)

Thickness	Weight Method	μm	7.4	8.3	9.0	10.0	11.0	11.2	11.8	12.7	13.6
	Micrometer Method	μm	(7.9)	(9)	(10)	(11)	(12)	(12.2)	(13)	(14)	(15)
Haze	AVE.	%	11	13	13	18	23	24	26	29	30
Space Factor	AVE.	%	8	9	9	9	9	10	10	10	10
Surface Roughness (Ra)		μm	0.20	0.22	0.18	0.27	0.23	0.28	0.29	0.24	0.32
Tensile Strength	MD	MPa	174	174	172	169	169	167	171	171	168
	CMD	MPa	208	229	230	214	215	221	225	223	217
Elongation at break	MD	%	121	138	144	149	156	152	152	158	154
	CMD	%	50	81	82	84	87	82	84	88	83
Heat Shrinkage (100°C×10 min)	MD	%	2.0	3.4	2.7	1.8	2.2	2.1	1.8	1.9	1.9
	CMD	%	1.8	1.7	1.7	1.6	1.8	1.8	1.9	1.8	2.0
Heat Shrinkage (120°C×15 min)	MD	%	4.7	5.6	5.1	4.6	4.2	4.1	4.4	4.4	4.1
	CMD	%	6.8	6.7	6.8	6.7	6.8	6.8	6.9	6.9	6.8
Dielectric Strength	AVE.	V _{DC} /μm	607	605	612	603	627	623	628	627	627
	Min.	V _{DC} /μm	583	581	589	561	585	596	592	595	581
Electric weak points (300 V _{DC} /μm)		count/m ²	0.144	0.056	0.054	0.017	0.002	0.004	0.001	0.002	0.008
Permittivity (Dielectric Constant)		—	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Volume Resistivity		Ω·cm	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶
Dissipation Factor (tanδ)		%	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Density		g/cm ³	0.905	0.905	0.905	0.905	0.905	0.905	0.905	0.905	0.905
Ash Content		ppm	<30	<30	<30	<30	<30	<30	<30	<30	<30
Chlorine Content		ppm	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

(The above values are measured values, not standard values.)

■ Shin-Etsu POLYPROPYLENE FILM R-TYPE (Typical Properties)


Thickness	Weight Method	μm	14.0	14.5	15.2	16.3	17.8	18.2	20.0	22.7	27.3
	Micrometer Method	μm	(15.4)	(16)	(16.5)	(18)	(19.5)	(20)	(22)	(25)	(30)
Haze	AVE.	%	33	34	36	35	43	36	38	37	43
Space Factor	AVE.	%	10	10	10	10	10	10	10	10	10
Surface Roughness (Ra)		μm	0.35	0.35	0.35	0.48	0.46	0.50	0.54	0.66	0.93
Tensile Strength	MD	MPa	165	172	168	163	168	162	168	165	152
	CMD	MPa	220	218	212	208	209	207	212	197	177
Elongation at break	MD	%	154	156	158	159	159	153	159	152	151
	CMD	%	87	89	85	89	90	83	88	91	88
Heat Shrinkage (100°C×10 min)	MD	%	1.9	2.0	2.1	1.5	2.0	2.3	2.5	1.9	2.7
	CMD	%	1.9	1.7	1.8	1.8	1.7	1.9	1.9	1.8	1.6
Heat Shrinkage (120°C×15 min)	MD	%	4.2	4.4	4.4	4.1	4.8	4.0	4.1	4.3	4.1
	CMD	%	6.9	6.7	6.8	6.4	6.7	6.7	6.7	6.8	6.7
Dielectric Strength	AVE.	V _{DC} /μm	625	636	641	620	624	616	635	633	591
	Min.	V _{DC} /μm	586	601	608	594	600	584	605	604	574
Electric weak points (300 V _{DC} /μm)		count/m ²	0.000	0.002	0.002	0.002	0.000	0.000	0.000	0.002	0.000
Permittivity (Dielectric Constant)		—	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20	2.20
Volume Resistivity		Ω·cm	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶	5×10 ¹⁶
Dissipation Factor (tanδ)		%	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Density		g/cm ³	0.905	0.905	0.905	0.905	0.905	0.905	0.905	0.905	0.905
Ash Content		ppm	<30	<30	<30	<30	<30	<30	<30	<30	<30
Chlorine Content		ppm	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5

(The above values are measured values, not standard values.)

■ Measurement Method

Properties	Item	Unit	Measurement method
Surface Properties	Haze	%	JIS K 6714
	Space Factor	%	JIS C 2330
	Surface Roughness	μm	JIS B 0601
Mechanical Properties	Tensile Strength	MPa	JIS C 2330
	Elongation at break	%	JIS C 2330
	Heat Shrinkage	%	JIS C 2330
Electrical Properties	Dielectric Strength	V _{DC} /μm	JIS C 2330
	Electric Weak Point	count/m ²	Contact electrode Method
	Permittivity (Dielectric Constant)	—	JIS C 2330
	Volume Resistivity	Ω·cm	JIS C 2330
	Dissipation Factor (tanδ)	—	JIS C 2330
General Properties	Density	g/cm ³	JIS K 7112
Chemical Properties	Ash Content	ppm	JIS C 2330
	Chlorine Content	ppm	Ion Chromatography

■ Slit roll label

 Shin-Etsu POLYPROPYLENE FILM			
Type	R	LotNo.	31630212-E10493
Thickness (μm)	10.0W	Length (m)	3,600
Width (mm)	320	Net Weight (kg)	10.4
81		01-1-1	
Made in Japan			

■ Storage and Handling Precautions

- Store out of direct sunlight in a cool place with low humidity.
- Do not use film more than six months after delivery date.
The film may deteriorate, causing problems in use.

Quality and Environment

Shin-Etsu Film Takefu plant acquired certification of ISO 9001 in 2003 and ISO 14001 in 2007.

We serve and contribute to customers all over the world.



ISO 9001, ISO 14001
Shin-Etsu Film Takefu plant
JCQA-1313
JCQA-E-0812



Contact Shin-Etsu Film for information about our PP films.

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