



# Teflon®

## Nonstick & Industrial Coatings

### Selecting DuPont *Teflon*® Coatings

There are many choices of *Teflon*® nonstick and industrial coatings, and understanding a bit about the technologies involved makes the selection process easier. For any particular end use, there may be several *Teflon*® coatings that will perform well. Drawing on experience of a Licensed Industrial Applicator is a good way to identify the best *Teflon*® coating for a given application. However, there is no substitute for testing in the actual end use in making a final selection. The types of *Teflon*® coatings available are described in the following paragraphs.

**PTFE** coatings have the lowest coefficient of friction and highest temperature resistance (260°C [500°F] on a continuous basis) of any of the *Teflon*® coating systems. PTFE coatings are very good electrical insulators and are extremely nonwetting. They are inert to almost all chemicals, but are somewhat porous, and thus permeable to water vapor and other gases. The substrate must be able to withstand a cure temperature of at least 370°C (700°F) to consider PTFE-based coating.

**FEP**-based *Teflon*® coatings have superb release, and are frequently used as mold release coatings. They melt flow to smooth, nonporous films, and are thus more chemically resistant than PTFE

coatings. FEP coatings have lower heat resistance (200°C [400°F]) than PTFE coatings but also cure at lower temperatures. FEP coatings are extremely nonwetting and have a very low coefficient of friction.

**PFA**-based coatings combine the high temperature resistance of PTFE coatings with the ability to achieve nonporous, chemical-resistant films like FEP. Films can be built to 40 mil (1000 microns) and are quite tough and abrasion resistant. Release and coefficient of friction are very good.

**ETFE** coatings offer extremely tough, abrasion-resistant films with high tensile strength. Films up to 100 mil can be built, but ETFE is limited in temperature resistance (150°C [300°F]) and provides only fair release compared with PTFE, PFA, and FEP.

*Teflon*® S coatings are self-priming, one-coat products. They are formulated with organic binders to improve adhesion without the use of primers, so they typically cure at lower temperatures than pure fluoropolymer dispersions. The fluoropolymer resin stratifies to the surface during the cure cycle. But because of the binder resins, certain properties of the pure fluoropolymers may be compromised, such as temperature resistance and release.

## Processing

*Teflon*<sup>®</sup> coatings may be applied to materials that can withstand the cure temperature of the coating.

Typical Fluoropolymer Topcoat	Cure Temperature
PTFE	370°C (700°F)
PFA	370°C (700°F)
FEP	340°C (650°F)
ETFE	315°C (600°F)
<i>Teflon</i> <sup>®</sup> S	175-340°F (350-650°F)

Before application of *Teflon*<sup>®</sup> nonstick and industrial coatings, the substrate must be thoroughly cleaned and blasted to provide good adhesion. Gen-

erally, PTFE, PFA, FEP and ETFE topcoats (not *Teflon*<sup>®</sup> S) require a primer. The coatings are generally spray applied and are available as powder and liquids. More specific processing information is given in the Fact Sheet available for each product.

## Food Contact

See product Fact Sheet for information on conformance to FDA regulations for food contact use.

## Technical Data

**Table 1** shows some general characteristics of resins used in *Teflon*<sup>®</sup> and *Teflon*<sup>®</sup> S coatings. Formulated coatings may deviate considerably from the resin.

**Table 1**

Property	Unit	Resin Type				Finish		ASTM
		PTFE	FEP	PFA	ETFE	Teflon® S		
Nonstick	—	E	E	VG	G	G	None	
Chemical Resistance	—	—	E	E	VG	G	None	
Abrasion Resistance	—	F	G	VG	E	E	None	
Salt Spray Resistance	—	F	E	E	E	E	None	
Water Absorption	%	<0.01	<0.01	<0.03	<0.007	—	D570	
Coefficient of Friction								
Kinetic	—	0.08	0.08	0.1	0.24	0.1–0.4	D1894	
Static		0.1	0.2	0.2	0.4	0.15–0.35		
Specific Gravity	none	2.20	2.15	2.15	1.70	—		
Melt Point	°F	627	500	575	520	—		
Hardness	Shore D	60	55	60	75	60–90	D2240	
Maximum Continuous Use Temperature	°C	260	205	260	150	150–260	None	
	°F	500	400	500	300	300–500		
Thermal Conductivity	(Btu) (in)/(ft <sup>2</sup> ) (hr) (°F)	1.70	1.35	1.30	1.65	—	DuPont Method	
Coefficient of Linear Thermal Expansion	in/in/°F	5.5	5.4	7.6	5.0	—	D-696 at 70°–212°F	
Dielectric Strength (short-term 10-mil film)	V/mil	1200	2000	2000	2000	Up to 1400	D149	
Surface Resistivity	ohm/sq	1.0E18	1.0E18	1.0E18	1.0E17	—	D257	
Volume Resistivity	ohm cm	1.0E18	1.0E16	1.0E16	1.0E16	—	D257	
Tensile Strength	MPa at 23°C	20	23	25	45	20–80	D1708	
Elongation at Break	% at 23°C	300	325	300	300	1–150	D1708	

**Note:** The values shown represent average experience and are not intended to be specifications.

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**For more information on Teflon® coatings**

DuPont  
Teflon® Nonstick & Industrial Coatings  
Chestnut Run Plaza  
P.O. Box 80702  
Wilmington, DE 19880-0702

**(800) 441-7515**  
**Fax: (302) 366-8602**

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**Europe**

DuPont de Nemours (Belgium)  
A. Spinostraat 6  
B-2800 Mechelen  
Belgium  
Tel.: 33-15-441188  
Fax: 33-15-441160

**Pacific**

DuPont Australia, Ltd.  
254 Canterbury Road  
Bayswater, Victoria 3153  
Australia  
Tel.: 61-3-9721-5617  
Fax: 61-3-9721-5690

**Japan**

DuPont K. K. (Teflon® Finishes)  
4th Floor, Chiyoda Honsha Building  
5-18 Sarugaku-cho, 1-chome  
Chiyoda-ku, Tokyo, 101 Japan  
Tel.: 81-3-5281-5888  
Fax: 81-3-5281-5899

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**Asia**

DuPont China, Ltd.  
Room 1122,  
New World Office Building  
(East Wing)  
Salisbury Road  
Kowloon, Hong Kong  
Tel.: 852-2734-5459  
Fax: 852-2368-3512

DuPont Korea  
4/5th Floor Asia Tower  
#726 Yeoksam-dong, Kangnam-ku  
Seoul, Korea  
Tel.: 82-2-222-5385  
Fax: 82-2-222-5478

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**CAUTION:** Do not use in medical applications involving permanent implantation in the human body. For other medical applications, see "DuPont Medical Caution Statement," H-50102.



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