



Teflon® PTFE 313A

fluoropolymer resin

Aqueous Dispersion

Brand

Teflon® is a registered trademark of DuPont for its brand of fluoropolymer resins, which can only be licensed by DuPont for use in approved applications. Customers who wish to use the *Teflon*® trademark in connection with DuPont products under license from DuPont should contact (800) 262-2745. Without a license, customers may not identify their product as containing *Teflon*®, but may refer to the resin as PTFE fluoropolymer dispersion 313A.

Description

Teflon® PTFE 313A fluoropolymer resin (formerly called TE-3313) is a negatively charged, hydrophobic colloid, containing approximately 60% (by total weight) of 0.05 to 0.5 µm PTFE (polytetrafluoroethylene) resin particles suspended in water. Seen as a milky white liquid, it also contains approximately 7% (by weight of PTFE) of a nonionic wetting agent and stabilizer. Viscosity at room temperature is approximately 20 cP. Nominal pH is 10.

Compared with other grades of PTFE dispersions, *Teflon*® PTFE 313A is especially formulated to provide void-free coatings with enhanced surface smoothness and gloss. It imparts many of the unique properties of PTFE resin to porous structures.

Teflon® PTFE 313A is similar to *Teflon*® PTFE 30B. Both are typically used to coat woven glass cloth. *Teflon*® PTFE 313A offers better gloss and slightly better wetting than *Teflon*® PTFE 30B.

When properly processed, the PTFE resin in *Teflon*® PTFE 313A exhibits the superior properties typical of the fluoropolymer resins: retention of properties after service at 260°C (500°F), useful properties at -240°C (-400°F), chemical inertness to nearly all industrial chemicals and solvents, and low friction and antistick surfaces. Dielectric properties are outstanding and stable with frequency and temperature. Refer to **Table 1** for typical property data.

Teflon® is a registered trademark of DuPont.

Typical End Products

Teflon® PTFE 313A is used for coated glass fabric for high-performance industrial or food conveyor belting and nonadhesive separator sheets for laminating or press blankets requiring high-quality surface finish; electrical insulation for wire, printed circuit boards, and rotating equipment; cast film for capacitors or chemical barriers; and surface coatings for other substrates.

FDA Compliance

Properly processed products (sintered at high temperatures common to the industry) made from *Teflon*® PTFE 313A resin can qualify for use in contact with food in compliance with FDA Regulation 21 CFR 177.1550. Products made from unsintered dispersion do not comply.

Processing

PTFE resin does not respond to solvent or melt processes. A dispersion of PTFE particles provides an alternate method for making coated or impregnated products.

Conventional dip or flow techniques can be used for coating or impregnating other products with *Teflon*® PTFE 313A. The resin particles can be consolidated by heat into a coherent matrix or coating or left as particles to influence the properties of a finished product.

A continuous PTFE resin coating on woven fabrics can be made by dip coating. Successive passes must be used to build up thickness slowly and without cracks. *Teflon*® PTFE 313A fluoropolymer provides good rewetting on each pass and void-free buildup suitable for more demanding electrical and chemical service applications. Each coating layer is usually dried to remove water (typically at 120°C

[250°F]), baked to remove the wetting agent (typically at 290°C [554°F]), sometimes calendered, and finally heated above the crystalline melting point of the resin particles (approximately 337°C [639°F]). Glass, PTFE, *Nomex*[®] aramid fiber, *Kevlar*[®] aramid fiber, or other high-temperature resistant fibers must be used.

Products utilizing entrained PTFE resin particles only for their lubricating or hydrophobic properties are dried and baked, but not heated above the crystalline melting point of the particles. For example, rope-like products, such as shaft packings, can be made from braided fabrics in a variety of cross sections. The dispersion wets internal surfaces and promotes penetration of the extremely small particles. The unmelted particles are sheared and retained as an impregnant, even when compressed in service and exposed to steam or chemicals. Unmelted particles also can improve flexibility and flex life. High-temperature resistant fibers are not necessarily required in these applications.

Other solid or liquid ingredients can be added to *Teflon*[®] PTFE 313A to provide specific processing or finished product behavior.

Safety Precautions

WARNING!

VAPORS CAN BE LIBERATED THAT MAY BE HAZARDOUS IF INHALED.

Before using *Teflon*[®] PTFE 313A, read the Material Safety Data Sheet and the detailed information in the “Guide to the Safe Handling of Fluoropolymer Resins,” latest edition, published by the Fluoropolymers Division of The Society of the Plastics Industry—available from DuPont.

Open and use containers only in well-ventilated areas using local exhaust ventilation (LEV). Vapors and fumes liberated during hot processing, or from smoking tobacco or cigarettes contaminated with *Teflon*[®] PTFE 313A, may cause flu-like symptoms (chills, fever, sore throat) that may not occur until several hours after exposure and pass within about 24 hours. Vapors and fumes liberated during hot processing should be exhausted completely from the work area; contamination of tobacco with polymers should be avoided.

Mixtures with some finely divided metals, such as magnesium or aluminum, can be flammable or explosive under some conditions.

Teflon[®] PTFE 313A contains additives in the aqueous phase that are irritants. In case of skin contact, flush with water immediately. In case of eye contact, flush with water immediately and get medical help.

Storage and Handling

The dispersion particles in *Teflon*[®] PTFE 313A will settle on prolonged standing or on heating above 66°C (150°F). They usually can be redispersed by mild agitation. Drums may be rolled or the product stirred gently just prior to use. The dispersion must be protected from freezing, which will cause irreversible settling.

Ammonium hydroxide is used by DuPont to set pH to 10 at the time of shipment. High ambient temperatures can deplete the ammonia level and reduce the pH. Declining pH eventually favors bacterial growth, which causes odor and scum. The pH should be measured and maintained between 9.5 and 10.

Both very high and very low temperatures may be detrimental. Dispersions must not be allowed to freeze. The optimum storage temperature range is 7–24°C (45–75°F), with temperatures low in the range preferred. Storage at 7–32°C (45–90°F) is acceptable within nominal shelf life for standard dispersions. If dispersions are to be stored for extended periods beyond their nominal shelf life, low-temperature storage is especially desirable because the particles are harder at lower temperatures and, therefore, are less likely to stick together as they settle.

High-speed stirring, pumping, or any other violent agitation must be avoided to minimize sheared particles or coagulation. Ideally, the dispersion should be conveyed by gravity from storage to processing stations.

Storage and handling areas should be clean. Keep dispersion drums closed and clean to avoid both contamination and coagulation by drying at the liquid surface. High processing temperatures will cause even very small foreign particles to become visible or to make defects in finished products. Good housekeeping and careful handling are essential.

Table 1
Typical Property Data for *Teflon*[®] PTFE Fluoropolymer Resin Dispersion Grade 313A

Property	ASTM Standard	Unit	Nominal Value
Percent PTFE Resin Solids	D4441	%	60
Weight of PTFE Resin Solids	D4441	kg/m ³ (lb/gal)	900 (7.5)
Specific Gravity of Dispersion	D4441	—	1.5
Average Dispersion Particle Size	—	μm	0.22
pH (min.) of Dispersion	E70	—	9.5
Viscosity of Dispersion (at 25°C [77°F])	D2196	cP (Pa-sec)	20 (0.02)
Melting, Peak Temperature			
Initial	D1457	°C (°F)	337 (639)
Second	D1457	°C (°F)	327 (621)

Notes: *Teflon*[®] PTFE 313A conforms to ASTM D4441-98, II 6B.
Typical properties are not suitable for specification purposes.

Packaging

Teflon[®] PTFE 313A is packaged in 19- and 114-L (5- and 30-gal) nonreturnable drums and 1037-L (275-gal) recyclable containers.

Freight Classification

Teflon[®] PTFE 313A, when shipped by rail or express, is classified “Plastics, Synthetic, Liquid, NOIBN.” Resin shipped by truck is classified “Plastics, Materials, Liquid, NOI.”

For more information on Fluoroproducts:**(302) 479-7731**

DuPont Fluoroproducts
P.O. Box 80713
Wilmington, DE 19880-0713

Europe

DuPont de Nemours Int'l SA
DuPont Fluoroproducts
2, chemin du Pavillon
P.O. Box 50
CH-1218 Le Grand-Saconnex
Geneva, Switzerland
(022) 7175111

Japan and Asia Pacific

DuPont Mitsui Fluorochemicals Co., Ltd.
Chiyoda Honsha Building
5-18, Sarugaku-cho 1-chome
Chiyoda-ku, Tokyo 101 Japan
81-3-5281-5872

Canada

DuPont Canada, Inc.
DuPont Fluoroproducts
P.O. Box 2200, Streetsville
7070 Mississauga Road
Mississauga, Ontario, Canada
L5M 2H3
(905) 821-5925

Latin America

Du Pont Fluoroproducts
Latin America Regional Office
P.O. Box 80702
Wilmington, DE 19880-0702
(302) 999-3582

The information set forth herein is furnished free of charge and is based on technical data that DuPont believes to be reliable. It is intended for use by persons having technical skill, at their own discretion and risk. The handling precaution information contained herein is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Because conditions of product use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information. As with any material, evaluation of any compound under end-use conditions prior to specification is essential. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

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.

**Teflon[®]****Only by DuPont**