DuPont Fluoroproducts

DuPont™ Teflon® PTFE TE-3823

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 TE-3823.

Description

DuPont™ *Teflon*® PTFE TE-3823 fluoropolymer resin is a negatively charged, hydrophobic colloid, containing approximately 60% (by total weight) of 0.05 to 0.5 µm polytetrafluoroethylene (PTFE) resin particles suspended in water. Seen as a milky white liquid, it also contains approximately 6% (by weight of PTFE) of a non-ionic wetting agent and stabilizer. Viscosity at room temperature is approximately 20 cP (mPa·s). Nominal pH is 10.

DuPont™ *Teflon*® PTFE TE-3823 is recommended for coating applications on a variety of substrates. It is specifically suited to the processes of roller and curtain coating of metal surfaces.

DuPont™ *Teflon*® PTFE TE-3823 is based on new and improved DuPont polymer and formulation technologies that ensure higher product quality and processing improvements in various coating applications. The product improvements include higher gloss, mechanical strength and durability, while the processor benefits from improved Critical Cracking Thickness, higher shear stability and sinterability, which lead to improved productivity and yields.

In addition, the polymer is formulated with a new nonionic wetting agent which burns off at approximately 50°C (90°) lower than traditional surfactants. This feature translates into another processing advantage due to lower fouling of the coating systems. The final product benefits from improved color.

When properly processed, the PTFE resin in *Teflon*® PTFE TE-3823 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.

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FDA Compliance

Properly processed products (sintered at high temperatures common to the industry) made from *Teflon*® PTFE TE-3823 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 cannot be processed by conventional melt or solvent transformation methods. Techniques to make coatings or castings from PTFE dispersions have been developed. These mostly involve the adequate application of the PTFE or mixtures thereof onto a substrate, followed by drying and sintering at temperatures above the melting point of PTFE.

Metal Substrates

Conventional coating of substrates such as metals can be done in general by spraying or roller coatings, and in some cases by curtain coating. These techniques require PTFE dispersions which are resistant to shear, in other words, the primary particles of PTFE should not deform or agglomerate during the application step. This is particularly true for roller and curtain coating. *Teflon*® PTFE TE-3823 has been proven to provide improved stability resistance to such high shear process operations. The film on the substrate should be fault or defect free, and exhibit a smooth finished surface. In these aspects *Teflon*® PTFE TE-3823 has also been proven to be an excellent product.

Typical processing temperatures are as follows: application at room temperature, drying at 110° to 120°C, surfactant removal at 250° to 270°C and sintering at 360° to 380°C. Nevertheless, exact settings will depend on the particular process conditions, such as speed and loadings, on the product architecture and the equipment used.

Fabric Substrates

Teflon® PTFE TE-3823 is also suitable for coating or impregnating of other materials, such as glasscloth.

Conventional dip or flow techniques can be used for coating or impregnating other products with *Teflon*® PTFE TE-3823. 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.

The surface tension of *Teflon*® PTFE TE-3823 is fairly low, about 27 dynes/cm. This could result in improved wetting of substrates.

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 TE-3823 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), baked to remove the wetting agent (typically at 250–290°C), sometimes calendered, and finally heated above the crystalline melting point of the resin particles (approximately 337°C). Glass, PTFE, *Nomex*® aramid fiber, *Kevlar*® aramid fiber, or other high-temperature resistant fibers must be used.

The excellent shear stability of *Teflon*® PTFE TE-3823 may also provide increases in productivity, yield, and quality.

Other solid or liquid ingredients can be added to *Teflon*® PTFE TE-3823 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 TE-3823, 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 TE-3823 fluoropolymer resin, 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 TE-3823 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.

Nomex® and *Kevlar*® are registered trademarks of DuPont.

Table 1
Typical Property Data for DuPont™ *Teflon*® PTFE Fluoropolymer Resin Dispersion Grade TE-3823

Property	Units	ASTM Method	TE-3823
Solids Content (% PTFE by weight)	%	D 4441	60
Weight of PTFE Resin Solids	kg/m^3 (lb/gal)	D 4441	900 (7.5)
Specific Gravity of Dispersion	g/mL	D 4441	1.5
Average Particle Size	nm	—	270
pH of Dispersion		E 70	10
Viscosity of Dispersion (at 25°C [77°F])	c	D 2196	20
Melting Point			
Initial	°C (°F)	D 4895	344 (653)
Second	°C (°F)	D 4895	327 (621)
Surface Tension	dynes/cm (mN/m)	—	27
Surfactant Content	%	D 4441	6
Surfactant Decomp. Temp	°C (°F)	E 1131	180 (356)

Notes: *Teflon*® PTFE TE-3823 conforms to ASTM D4441-98, II 5B.
Typical properties are not suitable for specification purposes.

Storage and Handling

The dispersion particles in *Teflon*® PTFE TE-3823 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 7–25°C (45–77°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 and to minimize foaming. 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.

Packaging

In the United States, *Teflon*® PTFE TE-3823 is packaged in 19- and 114-L (5- and 30-gal) nonreturnable drums and 1037-L (275-gal) recyclable containers.

In Europe, *Teflon*® PTFE TE-3823 is packaged in 30-L (8-gal) nonreturnable drums and 1000-L (263 gal) recyclable containers.

Freight Classification

Teflon® PTFE TE-3823, when shipped by rail or express, is classified “Plastics, Synthetic, Liquid, NOIBN.” Resin shipped by truck is classified “Plastics, Materials, Liquid, NOI.”

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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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