FLUOROPOLYMERS FOR THERMOPLASTICS, ELASTOMERS, AND THERMOSETS

SHAMROCK

Shamrock Recycles™

Shamrock Technologies is the global leader in PTFE micropowders. Shamrock creates a wide range of PTFE micropowder products, and leads the industry in recycling PTFE and developing new applications.

Shamrock Products for Thermoplastics, Elastomers, and Thermosets

As the leading producer of PTFE Micropowders, Shamrock offers a wide range of products made from natural prime as well as recycled PTFE. The use of recycled PTFE aids in reducing the carbon footprint relative to the use of natural prime materials. Shamrock offers PTFE micropowders in various particle sizes, molecular weights, and thermal stability. Our powders offer improved wear resistance and slip when used in engineering plastics, elastomers, and thermosets.

PTFE Is An Amazing Material ...

PTFE micropowders are used to reduce friction between contacting surfaces. The raw materials and processes used to make micropowders determine the properties such as surface energy, surface area, hardness and more.

When used in Engineering Plastics PTFE has the following benefits:

- Elimination of the need for external lubrication
- Reduced wear rates
- Lower and more consistent frictional responses
- Elimination of 'stick-slip'
- Elimination of chatter and other motion-induced noise
- And many more...

Typical Properties of PTFE MicroPowder

Specific Gravity	2.20-2.30
Solubility	Insoluble in Almost All Solvents
Heat Stability	Decomposition Starts Above 400°C
Surface Energy (dyne/cm)	19-20
Coefficient of Friction	0.05-0.10
Refractive Index	1.35 - 1.36

Typical Test Data

Wear Data

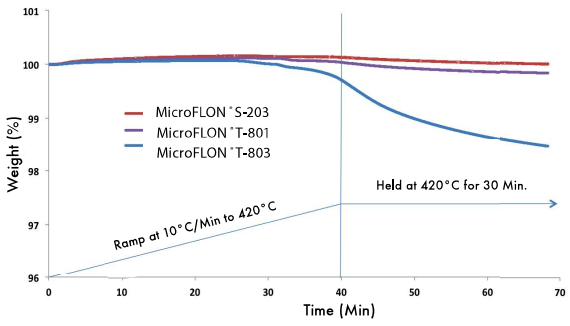
Tested Under ASTM D3702 Test Conditions
(Thrust Washer Test)

Resin	PTFE Micropowder	% Loading	K-Factor cm3 - min (x10^{10})KJ - sec	Coefficient of Friction
POM	PTFE	0	63.2	0.463
POM	MicroFLON® S-207	10	12.5	0.239
POM	MicroFLON® T-807	10	10.9	0.226
Nylon 66	PTFE	0	1415.0	0.577
Nylon 66	MicroFLON® S-207	10	77.0	0.215
Nylon 66	MicroFLON® T-807	10	70.6	0.204

Tested under GB 3960 Test Conditions
(Block on Ring Test)

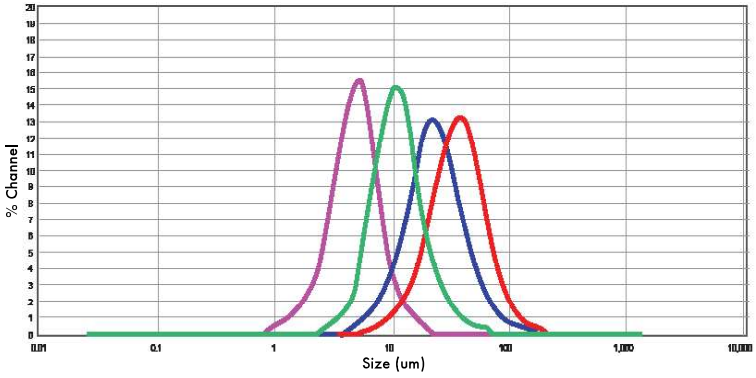
Resin	PTFE Micropowder	% Loading	Wear Rate/cm/hr (x10^{6})	Coefficient of Friction
Polycarbonate	PTFE	0	0.2375	0.70
Polycarbonate	MicroFLON® S-203	10	0.0005	0.29
Polycarbonate	MicroFLON® T-803HT	10	0.0006	0.32

Thermal Stability of Select MicroFLON® PTFE Micropowders by Thermal Gravimetric Analysis



Increased Temperature by 10°C/min up to 420°C, then held temperature at 420°C for 30min

Particle Size Distribution



MicroFLON® S-205 MicroFLON® S-211 MicroFLON® T-801 MicroFLON® T-803HT

As the leading producer of PTFE Micropowders, Shamrock offers a wide range of products made from natural prime as well as recycled PTFE.

MicroFLON® S

Suspension Grade Natural Prime PTFE Powder

In thermoplastics, elastomers, and thermosets, MicroFLON®S products facilitate lubrication and wear resistance. They may be easily compounded for use in PA, PC, POM, ABS, PBT, blends, and select grades are suitable for high temperature engineering plastics such as PPS, PEEK, and PEI.

		MicroFLON®S			
Typical Properties	Method	S-203	S-205	S-207	S-211
Particle Size Mean Value (µm)	ASTM D4464	15-25	10-20	10-12	4-6
90% of Particles Under (µm)	ASTM D4464	40	35	20	10

NanoFLON®

Sub-micron Natural Prime PTFE Powders

NanoFLON® products are offered as agglomerated particles to aid with free flow and ease of incorporation, with a primary particle size as low as 200 nanometers. They are being compounded into a variety of elastomers, fluorinated polymers, PP, and PS for specialty films to improve the surface lubricity and wear resistance.

		NanoFLON®		
Typical Properties	Method	102	114T	119N
Particle Size Mean Value (µm)	ASTM D4464	< 20	4-8	4-8
90% of Particles Under (µm)	ASTM D4464	13	12	12
DSC Melting Point (°C)	ASTM D4591	333	327	320

MicroFLON® T

Sintered Recycled Powder

These powders are designed for thermoplastics, elastomers, and thermosets to reduce friction and enhance wear properties. They may be used in compounds based on PA, POM, PC, PP, ABS, blends, as well as a variety of elastomers and thermosets.

		MicroFLON®T			
Typical Properties	Method	T-801	T-803HT	T-807	T-815
Particle Size Mean Value (µm)	ASTM D4464	35-55	20-25	10-12	4-6
90% of Particles Under (µm)	ASTM D4464	70	50	20	10
DSC Melting Point (°C)	ASTM D4591	> 327	> 327	> 325	> 315

MicroFLON® and NanoFLON® For food contact

These MicroFLON® and NanoFLON® powders are natural prime grade micronized PTFE designed for food contact applications. These PTFE additives are are recommended for thermoplastics and elastomers to reduce friction and enhance anti-wear properties. These products meet the requirements of 21 CFR 177.1550.

Typical Properties	Method	MicroFLON®1433FG	MicroFLON® 1437FG	NanoFLON® 101T
Particle Size Mean Value	ASTM D4464	4-6 µm	10-12 µm	6-9 µm
90% of Particles Under	ASTM D4464	10 µm	20 µm	-
Primary Particle Size	SEM	N/A	N/A	0.2 µm
DSC Melting Point (°C)	ASTM D4591	> 328	> 328	> 323
Bulk Density	ASTM D4894/4895	300-550 g/l	300-550 g/l	200-500 g/l
Surface Area	ASTM D5675	1.0-3.0 m^2/g	1.0-3.0 m^2/g	6.0-8.0 m^2/g

RECYCLING **IRRADIATION** **MILLING** **QUALITY CONTROL** **FINAL PRODUCT**

Proprietary Process Control

Shamrock Technologies controls manufacturing from sourcing to delivery: raw material selection/ classification; proprietary production capabilities; Quality Control; delivery and customer satisfaction. This complete process control is our guarantee of quality.

Shamrock Recycles

For 75 years Shamrock has led the way in the processing of recycled PTFE. Today we are the world's largest recycler of PTFE. Join us in helping reduce the carbon footprint of fluoropolymers.

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