Technical Data Sheet

Tospearl™ 120FL,130FL, 145FL, 1100FL

Silicone Beads for BOPP Film Applications

Description

Tospearl 120FL, 130FL, 145FL and 1100FL spherical silicone beads have narrow particle size distributions and mean particle diameters of approximately 2, 3, 4.5 and 10 microns, respectively. Their uniform particle sizes, thermal stabilities and low surface energies make them excellent candidates to consider for use as additives to BOPP films in which slip and antiblock properties are required.

Key Features and Typical Benefits

- Can enhance antiblocking and slip for polyolefin films such as BOPP due to spherical geometry and narrow particle size distributions.
- Can be compounded with thermoplastics using typical polymer processing equipment (e.g. extruders) because of high heat resistance.
- Can help achieve stable and low coefficient of friction (CoF) surfaces after film when extrusion beads do not migrate.
- Do not typically cause change in the printability of films.

Typical Physical Properties

Property	Tospearl 120FL beads	Tospearl 130FL beads	Tospearl 145FL beads	Tospearl 1100FL beads
Appearance	White spherical beads	White spherical beads	White spherical beads	White spherical beads
Mean particle diameter[1] (µm)	1.8 - 2.3	2.3 - 3.1	4.0 - 5.0	8.5 - 10.5
Weight loss @ 250 °C and 0.5 hours, %	< 1.0	< 1.0	< 1.0	< 1.0
pH[2]	6.0 - 8.0	6.0 - 8.0	6.0 - 8.0	6.0 - 8.0
Bulk specific gravity	0.35	0.36	0.43	0.66
Particle specific gravity	1.32	1.32	1.32	1.32
Refractive index	1.42	1.42	1.42	1.42

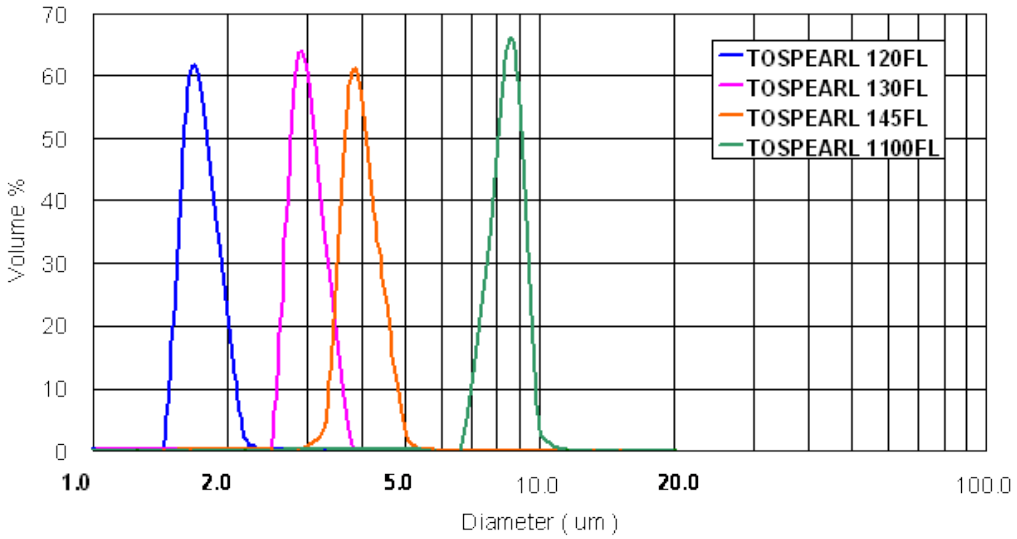
[1]Instrument: Coulter Counter Multisizer Ⅱ

(electrical sensing zone method)

[2]A 2% dispersion in methanol/water (1/1)

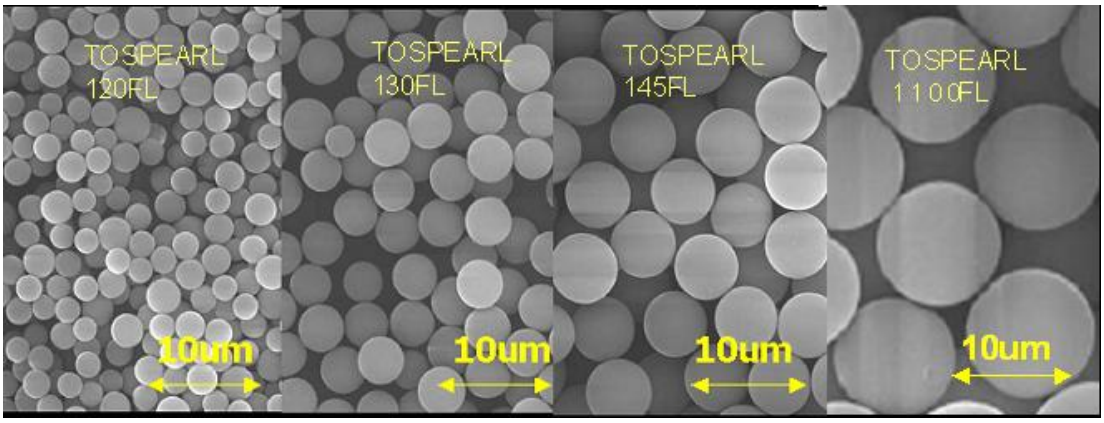
Typical properties are average data and are not to be used as or to develop specifications.

Particle Size Distribution



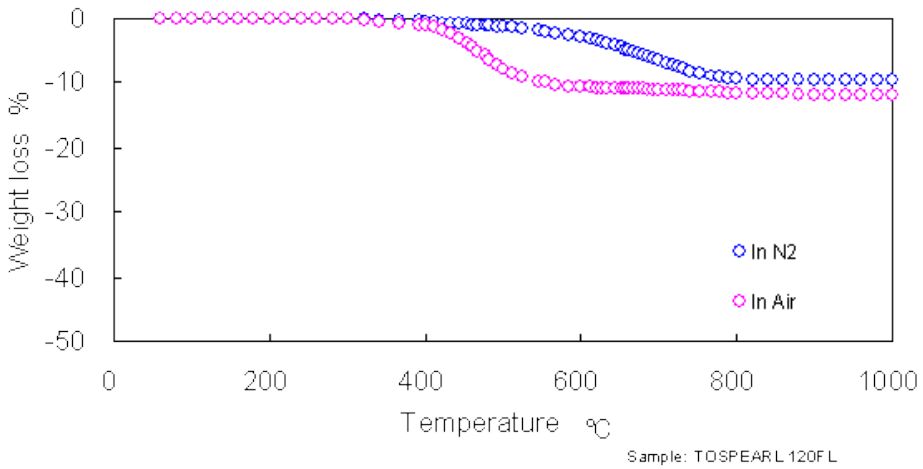
Tospearl 120FL, 130FL, 145FL and 1100FL beads have a very sharp particle size distribution.

Scanning Electron Micrographs



SEM illustrates the uniform size distribution of the spherical 2, 3, 4.5 and 10-micron beads.

Thermal Stability



Instrument: Coulter Counter Multisizer II
(electrical sensing zone method)
Dispersion medium: aqueous surfactant solution
Dispersing condition: Ultrasonic dispersion
Note: Test results. Actual results may vary.

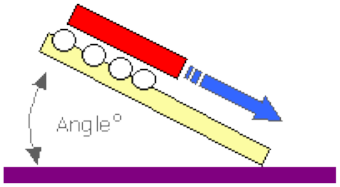
The thermogravimetric analysis data of Tospearl 120FL silicone resin beads is shown below. The scan rate was 10 °C per minute. Tospearl 120FL silicone resin beads showed thermal decomposition at temperature in excess of 420 °C. Weight loss was minimized to 12-13% even if heated to 900 °C. Tospearl 130FL, 145FL and 1100FL beads showed the same behavior of thermal properties.

Potential Applications

Antiblocking and slip agent for BOPP films

Tospearl 120FL, 130FL, 145FL and 1100FL beads' low surface energies, uniform sizes and spherical shapes are key properties that can help impart lubricity properties to films.

The slip properties are illustrated using a simple test.



Angle is recorded when block starts sliding.

A comparison with blank and silica –containing surfaces showed significantly better lubricity of the surface containing the Tospearl FL grades:

	Slide Angle (°)
Tospearl 120FL bead	5°
Silica	17°
Blank	19°

Note: Test results. Actual results may vary.

Comparison of properties of BOPP film[1] using Tospearl 120FL beads or silica

	Silica (2 µm)	Tospearl 120FL beads (2 µm)
Dosage level (%)	0.15	0.15
Coefficient of Friction[2] @ 23 °C	0.30	0.20
Coefficient of Friction[2] @ 80 °C	1.80	0.60
Coefficient of Friction[3] @ 80 °C	1.40	0.50

Note: Test data. Actual results may vary.

[1]Ideal thickness of skin layer containing **Tospearl 120FL beads** was 40% of the diameter of the particle in order to assure good retention
[2]ASTM D-1894 (film on film)
[3]ASTM D-1894 (film on metal)

Low coefficient of friction surfaces can be obtained with dosage levels of Tospearl 120FL beads as low as 0.05%.

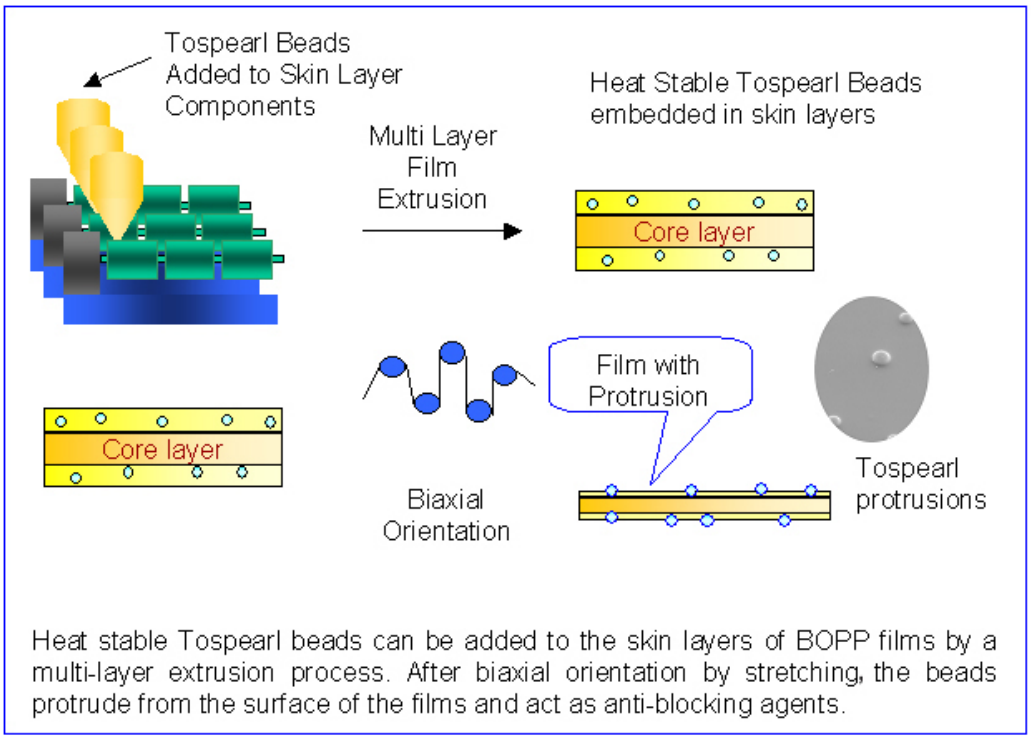
Good hot-slip properties facilitate easy processing and faster line speeds in packaging applications, such as cigarette production, and converting equipment. Tospearl FL grades can help prevent film from tearing.

The antiblocking properties of Tospearl FL beads can help prevent adhesion during film production, either on a finished roll, or on the inside of the bubble.

Additionally, the small differences between the refractive indices of Tospearl FL beads and the polyolefin resin can help yield films of high transparency and clarity, with high gloss properties.

Competitive products often lead to higher coefficients of friction and poorer haze values for the BOPP film.

BOPP Film Process



Heat stable Tospearl beads can be added to the skin layers of BOPP films by a multi-layer extrusion process. After biaxial orientation by stretching, the beads protrude from the surface of the films and act as anti-blocking agents.

Patent Status

Standard copy to come

Product Safety, Handling and Storage

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Limitations

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