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

<table>
<thead>
<tr>
<th>Property</th>
<th>Tospearl 120FL beads</th>
<th>Tospearl 130FL beads</th>
<th>Tospearl 145FL beads</th>
<th>Tospearl 1100FL beads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>White spherical beads</td>
<td>White spherical beads</td>
<td>White spherical beads</td>
<td>White spherical beads</td>
</tr>
<tr>
<td>Mean particle diameter (µm)</td>
<td>1.8 - 2.3</td>
<td>2.3 - 3.1</td>
<td>4.0 - 5.0</td>
<td>8.5 - 10.5</td>
</tr>
<tr>
<td>Weight loss @ 250 °C and 0.5 hours, %</td>
<td>&lt; 1.0</td>
<td>&lt; 1.0</td>
<td>&lt; 1.0</td>
<td>&lt; 1.0</td>
</tr>
<tr>
<td>pH</td>
<td>6.0 - 8.0</td>
<td>6.0 - 8.0</td>
<td>6.0 - 8.0</td>
<td>6.0 - 8.0</td>
</tr>
<tr>
<td>Bulk specific gravity</td>
<td>0.35</td>
<td>0.36</td>
<td>0.43</td>
<td>0.66</td>
</tr>
<tr>
<td>Particle specific gravity</td>
<td>1.32</td>
<td>1.32</td>
<td>1.32</td>
<td>1.32</td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
<td>1.42</td>
</tr>
</tbody>
</table>

1 Instrument: Coulter Counter Multisizer II

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(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

![Particle Size Distribution Graph]

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

Scanning Electron Micrographs

![SEM Images]

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

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.

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

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<table>
<thead>
<tr>
<th></th>
<th>Silica (2 µm)</th>
<th>Tospearl 120FL beads (2 µm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dosage level (%)</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Coefficient of Friction&lt;sup&gt;2&lt;/sup&gt; @ 23 °C</td>
<td>0.30</td>
<td>0.20</td>
</tr>
<tr>
<td>Coefficient of Friction&lt;sup&gt;2&lt;/sup&gt; @ 80 °C</td>
<td>1.80</td>
<td>0.60</td>
</tr>
<tr>
<td>Coefficient of Friction&lt;sup&gt;3&lt;/sup&gt; @ 80 °C</td>
<td>1.40</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Note: Test data. Actual results may vary.

<sup>1</sup>Ideal thickness of skin layer containing **Tospearl 120FL beads** was 40% of the diameter of the particle in order to assure good retention

<sup>2</sup>ASTM D-1894 (film on film)

<sup>3</sup>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

Standard copy to come

Limitations

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For literature and technical assistance, visit our website at: www.momentive.com

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