SIPERNAT® specialty silica and AEROSIL® fumed silica in instant beverages

Technical Information 1356
**SIPERNAT® and AEROSIL® products assist in the manufacture of high quality powdered beverages**

SIPERNAT® and AEROSIL® products are essential for smooth manufacturing of high quality instant beverages. Of utmost importance is that the dry ingredients and final mixture flow well and do not cake. Excellent flow behavior of all ingredients is crucial for accurate dosing and processing of powders by the manufacturer. Easy handling of the instant drink is an advantage for the consumer, too as this means increased convenience.

Minimized caking is important for retaining the quality of the instant beverage, even under sometimes adverse storage conditions in food service restaurants or at the consumer’s home. When powder caking of the powdered beverage is inhibited, reduction of the moisture barrier in the packaging might be possible, thus reducing packaging costs.

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**Advantages of using SIPERNAT® or AEROSIL® products to optimize flow and reduce caking of powdered beverages include:**

- **Optimized flow**
  - Improved dosing of ingredients
  - Better mixture handling
  - Increased convenience for end consumers

- **Reduced caking**
  - Maintenance of quality during shelf life
  - No lumps mean easier beverage preparation
  - Reduced need for moisture barrier in packaging

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**Examples of instant beverages, which benefit from SIPERNAT® and AEROSIL® products:**

- **Milk powder for chocolate or other flavored milk drinks**
- **Non-dairy creamer for cappuccino or instant coffee**
- **Sugar in instant fruit drinks**
- **Hygroscopic vitamins or minerals in sports- and functional drinks**
- **Flavors or extracts with a high oil or fat content**
Optimized flowability and reduced caking of dry powders

The addition of just 0.5 to 1 % of SIPERNAT* or AEROSIL* silica is sufficient to improve the flow characteristics of problematic sticky ingredients, such as milk powder or non-dairy creamer, and achieve very good flowability that facilitates dosing and handling of the powders.

In many different applications SIPERNAT* and AEROSIL* products outperform other flow aids in their effectiveness (Figure 1).

Moreover, tests in various powdered beverages have shown that SIPERNAT* and AEROSIL* products can effectively prevent caking and agglomeration due to moisture uptake caused by hygroscopic ingredients during storage. Figure 2 shows the example of an apple flavored powdered drink stored at 30 °C and 60 % relative humidity. After three days of storage, the powdered drink was sieved (1.4 mm) in order to remove lumps from the powder. Caking was minimized in the sample containing SIPERNAT* 22 S which passed easily through the sieve.

Dust reduction by free flow and anti-caking agents

The more particles of raw materials stick to each other the less likely it is that they will cause dust. By carefully choosing the right free flow and anti-caking agent it is often also possible to minimize the dust content of a powder mixture.

Figure 3 shows the dust content of instant tea mixed together with silica products in different concentrations. In contrast to the tea sample without silica, all samples containing silica contained significantly less dust.

* Cafos M, producer Budenheim Germany

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**Figure 1: Flow grade of cream milk powder**

![Flow grade chart](image)

- **Excellent**
- **Insufficient**

**Addition level of flow aid**

<table>
<thead>
<tr>
<th>Addition level of flow aid</th>
<th>Flow grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Excellent</td>
</tr>
<tr>
<td>0.5</td>
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</tr>
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</tr>
<tr>
<td>2.0</td>
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**Flow improvement of cream milk powder with SIPERNAT® 22 S compared to tricalcium phosphate**

Measurement by flow funnels, internal EVONIK Industries method: PA IM-SI-PS-AT/CHEM 7009 E.01

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Figure 2: Apple-flavored instant drink with different anti-caking aids after storage

Raw material without anti caking aid

2 % magnesium oxide**

2 % tricalcium phosphate*

2 % magnesium oxide**

2 % SIPERNAT® 22 S

Apple powder untreated (top left), with 2 % tricalcium phosphate* (top right), with 2 % magnesium oxide (bottom left) and with 2 % SIPERNAT® 22 S (bottom right).

Mixing conditions: Tumble Mixer (Turbula, Willi Bachofen AG) for 15 minutes. Storage and sieving procedure see page 3.

* Cafos M, producer Budenheim Germany
** Magnesium oxide p.a., producer Merck, Germany
Figure 3: Instant tea dust reduction

Mixing conditions: Somakon Mixer, speed 400 rpm, 3 min.
Measurement: dust view, Palas®
Measurement of dustiness analogous to CIPAC MT 171, internal Evonik Industries method: PA IM-SI-PS-AT/LSC 7018 D.03

High performance flow aids like SIPERNAT® specialty silica are cost effective

The spacer effect separates the host particles and minimizes the attractive forces between them. The absorption capacity keeps the product surface dry and prevents caking during production, transport and storage.

The absorption capacity of SIPERNAT® silica is huge. SIPERNAT® 22 S can absorb twice its own weight and SIPERNAT® 50 S even three times of its own weight in liquid.

Both features together make SIPERNAT® and AEROSIL® silica high performance process aids that prevent caking and keep your products free-flowing.

On average only half as much SIPERNAT® specialty silica or AEROSIL® fumed silica is required to achieve the same or better flowability and anticaking effect compared to tricalcium phosphate® (Figure 4).

Because of their higher efficacy SIPERNAT® or AEROSIL® products help to reduce overall production costs.

The high performance of SIPERNAT® and AEROSIL® products results from the simultaneous combination of spacer effect and moisture absorption capacity.
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