EVONIK INDUSTRIES

AEROSIL® and SIPERNAT® for spices and seasonings

Technical Information 1364

Evonik. Power to create.

AEROSIL® and SIPERNAT® facilitate the manufacturing and handling process of herbs and spice blends

The variability of herbs and spices nowadays used by the food industry, restaurants or private kitchens is bigger than ever before. Consumers are looking for new taste sensations and they are always keen to experiment with various condiments and their mixtures.

Aside from the new taste sensations, key-factors for the market-success of spice-blends and seasonings are superior quality and convenience. The mixture must be precisely dosed and the powder should be easy to handle.

To achieve this, good flowability of the seasoning and all powdered ingredients is a key issue. For exact dosing of each ingredient it must not form lumps or stick to the wall of hoppers or conveyors. Even if some aromatic condiments have been transported a long way from their origin to the manufacturing plant, there should be no severe caking of the powder, which makes it difficult to unload them. The consumer wishes to be able to pour out the spice of the packaging easily independent of how long and under which condition the product is stored.

As the eye must be pleased by the food as well, it is important to consider look and appearance of herbs and spices when developing products. An intensive, dark color of spices is regarded as an indication for fresh and high quality spices. Therefore a reduction in color-intensity is to avoid.

During manufacturing of spices and seasonings, another crucial aspect is dust-generation. Often, a good flowability and low caking goes in line with high dust-values. Especially when small particle-sized, hot or intensive spices, such as chili, capsicum and vinegar powders, are used, dust may become more than inconvenient for the workers. Avoiding dust therefore is very important for safe and hygienic manufacturing of condiments and seasonings.

With its AEROSIL® fumed and SIPERNAT® precipitated silica Evonik offers a versatile range of flow- and anti-caking aids to insure the optimal handling and manufacturing properties of your herbs, spices or seasonings.

Moreover, with its long years of experience, Evonik supports you in developing the ideal way of applying the Specialty Silica to your product.

Key-Aspects for successful handling of spice or seasoning mixtures:

- Unchanged taste and appearance
- Constant flowability
- Minimized caking
- Low dust

Key-Factors of influence:

- Nature of spice or seasoning
- Type of silica
- Dosage of silica
- Mixing conditions
- Environment

AEROSIL® and SIPERNAT® for free-flow and anti-caking

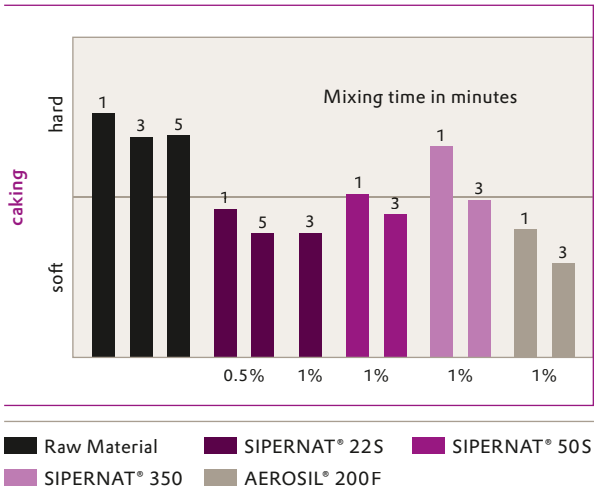
Herbs and spices vary in their chemical and physical nature. The storage and handling conditions can differ significantly, causing multiple reasons for bad flowability or caking. For example, onion and garlic powders with a high carbohydrate content of up to 80 % [1] tend to form lumps because of the hygroscopicity of this main component. Seasonings based on salt or sugar preparations cake intensively due to hygroscopicity as well. Paprika or capsicum powders consist of a high amount of oil and fat, sometimes more than 10 % [1], which causes bad flow and caking.

Depending on the nature of the material, the solution must be adapted individually.

In a recent series of tests, we investigated the behavior of various flow and anti-caking aids in two different seasoning blends. Our findings are the following:

For example in a seasoning for sausages SIPERNAT® 22 S or AEROSIL® 200 F are recommended as anti-caking aid. The necessary dosage depends on the type of silica used. As shown in Figure 1, between 0.5 to 1 % addition of silica is sufficient to inhibit caking effectively. In addition, the results demonstrate the influence of proper mixing on the efficiency of various anti-caking aids. Too short mixing times are not sufficient to reach the optimum anti-caking performance. The most suitable mixing conditions depend on type and dosage of the used silica.

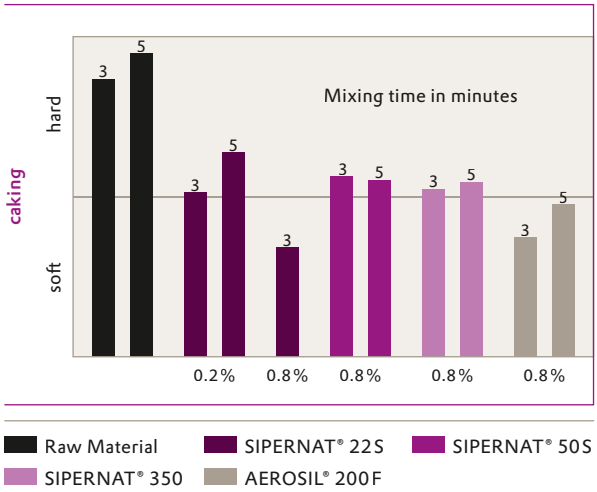
Figure 1
Especially AER0SIL® 200 F and SIPERNAT® 22 S reduce the hardness of caked seasonings significantly! Between 0.5 to 1 % of Specialty Silica added are enough to achieve good anti-caking effect. Optimal anti-caking performance is achieved with an individually optimized mixing procedure only.



Example: internal tests with seasoning for boiled sausages
mixing conditions: Somakon-mixer 400 Upm, storage 22 h at 35 °C and 25 % rH, Caking value represents the force needed to scratch of a certain layer of the caked seasoning.

An other example, a paprika-seasoning for chips, shows, AEROSIL® 200 F and SIPERNAT® 22 S offer a very good caking-prevention. In Figure 2 it can bee seen, how the dosage of the silica and mixing time influence the efficiency. SIPERNAT® 22 S is sensitive to "over-mixing". The anti-caking performance may be reduced by too long mixing times. On the other hand, SIPERNAT® 50 S is more tolerant against shear forces, so the efficiency is not reduced by prolonged mixing time.

Figure 2
Again AER0SIL® 200 F and SIPERNAT® 22 S reduce the hardness of caked seasonings significantly! Beside type of silica, the dosage and mixing conditions need to be adjusted for optimal anti-caking performance



Example: internal tests with paprika seasoning for chips
mixing conditions: Somakon-mixer 400 Upm; storage 22 h at35 °C and 25 % rH, Caking value represents the force needed to scratch of a certain layer of the caked seasoning.

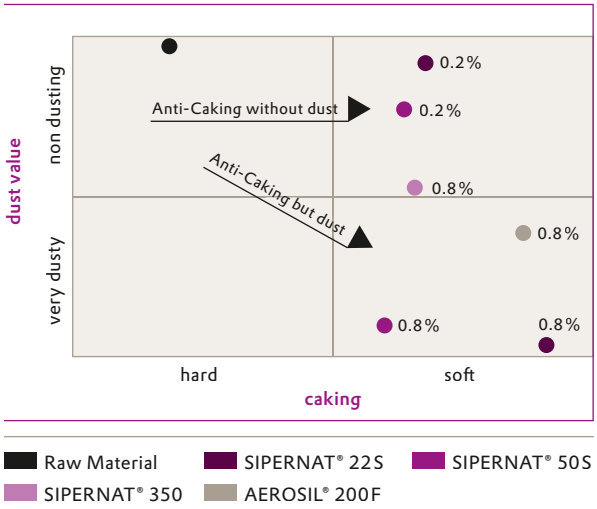
[1]: **Ulrich Gerhardt:** Gewürze in der Lebensmittelindustrie, S 54, Behrs Verlag

Ways to minimize dust and maximize flowability by the use of AEROSIL® or SIPERNAT®

Good flowability needs individually separated particles. Unfortunately, the less the individual particles stick to each other the more likely it is that they will cause dust. Because of this, free flowing or non-caking powders often tend to dust more compared to their untreated counterparts. By carefully choosing the most appropriate flow aid the generation of dust can be minimized at the best possible flowability.

In the example of the non-dusting paprika seasoning for chips it was found, that SIPERNAT® 50 S, SIPERNAT® 22 S or SIPERNAT® 350* are especially beneficial as they avoid the trade-off between anti-caking and dust. Figure 3 summarizes those results. By reducing the caking tendency of this material there is the risk to generate dust, namely when using to high concentrations of the anti-caking aid or using an unsuitable mixing process. In this case, 0.2 % SIPERNAT® 50 S or 22 S offers a very good performance in terms of caking and dust, while an increase in concentration to 0.8 % does not reduce the caking further but increases dustiness. When SIPERNAT® 350 is used, even at 0.8% dosage, there is no significant increase in dustiness of the seasoning while caking is reduced. Optimizing the type and dosage of flow aid, helps to achieve your goals.

Figure 3
SIPERNAT® 22 S, SIPERNAT® 50 S and SIPERNAT® 350 reduce the hardness of caked seasonings significantly without generation of dust! To avoid the downside of dust generation, type, dosage of specialty silica and the mixing conditions must be chosen carefully.

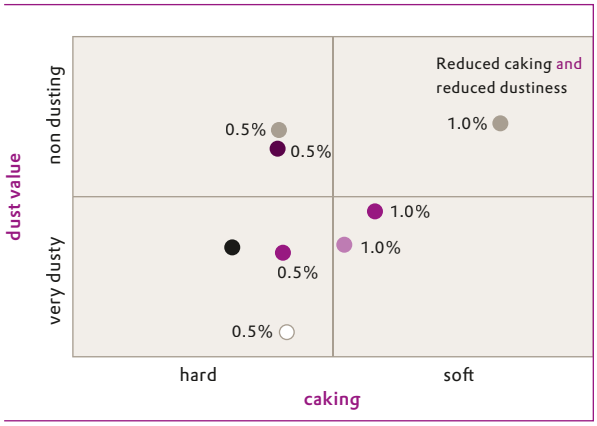


Example: internal tests with paprika seasoning for chips
mixing conditions: Somakon-mixer 400 Upm 3 minutes, analysis of dust value by light scattering; storage 22 h at 35 °C and 25 % rH Caking value represents the force needed to scratch of a certain layer of the caked seasoning.

In some cases of dusting powders, such as the sausage-seasoning mentioned, certain types of Evonik Specialty Silica may even reduce the dustiness of the raw material. This is shown in Figure 4. AEROSIL® 200 F performs best in reducing dustiness and caking. Depending on what your priority is, dust or anti-caking performance, it also can be recommended to use SIPERNAT® 22 S if dust is the key or SIPERNAT® 50 S when anti-caking is the main objective.

* SIPERNAT® 350: For food applications in Europe only a special type is available, please contact the responsible sales department.

Figure 4
In some cases Evonik Specialty Silica even may reduce dustiness of seasonings, such as AEROSIL® 200 F. As dosage, type of silica and mixing conditions influence both, caking behavior and dustiness. It is crucial to adopt the procedure individually to your product and your objectives.



Raw material
SIPERNAT® 22S
SIPERNAT® 50S
SIPERNAT® 350
AEROSIL® 200F
Tricalcium phosphate

Example: Internal tests with seasoning for boiled sausages
mixing conditions: Somakon-mixer 400 Upm 3 minutes, analysis of dust value by light scattering; storage 22 h at 35 °C and 25 % rH, Caking value represents the force needed to scratch of a certain layer of the caked seasoning.

These two examples above point out the number of aspects manufacturers need to take into consideration when optimizing powder-behavior of your product.

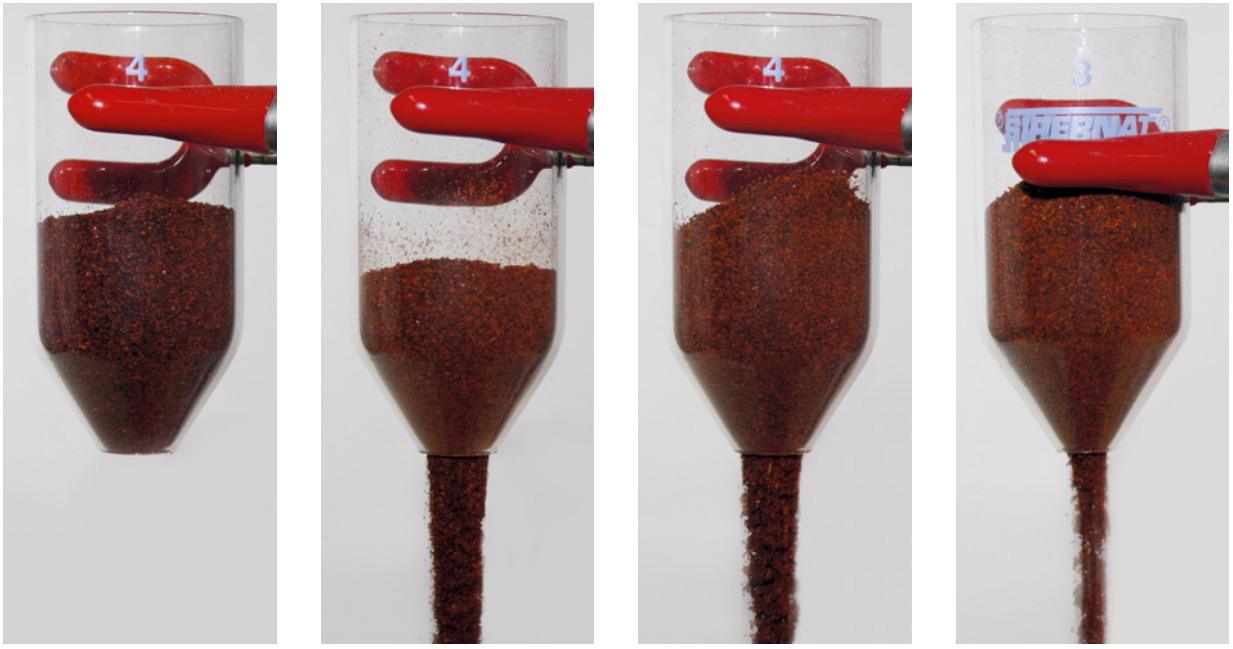
As all effects achieved by silicon dioxide depend highly on the way of mixing the silica with the host powder, it is critical to choose the optimum methodology for blending the powder mixture [2]. Please contact us for further details on Evonik Specialty Silica and the best way to take advantage of them.

[2]: **Evonik Industries AG:** TI 1231 Performance Silica as Flow Agent and Carrier Substance – Recommended Mixing Procedures for Powders and Granulates

Evonik Specialty Silica improve the flowability by maintaining the color

The first impression of the quality of a seasoning the consumer develops by means of the appearance, notably the color and the absence of any lumps. Visual evaluation is often the decision criterion for purchasing a product or not. It is crucial not to influence the appearance of a spice blend or seasoning negatively when optimizing its flow and caking properties.

In a chili powder, for example, the dark red color needs to be maintained. As shown in picture 1, Evonik Specialty Silica achieves this. An addition of 2 % SIPERNAT® 350 or AEROSIL® 200 F allow for improving the flow without lightening the color of the chili. The treated spice flows out of a testing-funnel with a defined diameter, the raw material does not flow. With SIPERNAT® 50 S only 1 % is enough to achieve even a further improvement in flowability. The powder flows through an even smaller diameter of the testing-funnel, grade 3.



Picture 1 Measuring the flow grade of various Chili powders. From left:
Untreated raw material; treated with SIPERNAT® 350; treated with AEROSIL® 200 F; treated with SIPERNAT® 50 S

Summary:

As demonstrated above, various factors must be considered, when choosing the right flow and anti-caking aid for spices and seasoning. Depending on your product and the specific manufacturing process, the type and dosage of the added Performance Silica needs to be carefully selected.

- When free-flow and caking-inhibition during storage is key for you, SIPERNAT® 50 S or AEROSIL® 200 F could be suitable options.
- If dust-minimization while improving the flowability is important at your plant, formulations including AEROSIL® 200 F or SIPERNAT® 350 or SIPERNAT® 22 S should be tested.
- For maintaining the colour and good flowability SIPERNAT® 350 or AEROSIL® 200 F are successful options.

Our experienced application-team at Evonik is looking forward to providing further, personal service for you.

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