Bakery
A Multifunctional Ingredient for Baked Goods
Fortified foods are an efficient solution to compensate for the lack of specific nutrients in daily foodstuffs, such as baked products. UK Bread and Flour Regulations for example, mandate the industry to add certain nutrients including calcium to all wheat flour at the milling stage of processing.

Nutrient intake from our regular diet might fail to reach the daily recommended doses, particularly for macronutrients like calcium. Calcium as a macronutrient should be ingested in relatively high quantities. Calcium rich foods such as dairy products, which are required to ensure adequate calcium supply are often not consumed in sufficient quantities.

Moreover, dietary restrictions such as lactose intolerance can require the consumption of dairy alternatives, which need to be fortified with calcium. Calcium Carbonate (CaCO₃) is an inorganic calcium salt, without allergenic effects and no taste drawbacks making it an ideal mineral source for fortification.

Omya offers a large range of high-purity natural Calcium Carbonates in tailored particle sizes and shapes, which are an excellent choice to fortify baked products with additional technological and sensorial benefits.

**PRODUCTS:**
- Omya Calcipur®
- Omya-Cal®
- Omyabake®
Excellent Source of Calcium

Omya natural Calcium Carbonate is a bioavailable source with the highest elemental calcium content

With 40% of available elemental calcium, it only takes 1/4 gram of Omya natural Calcium Carbonate to provide 100 mg of elemental calcium: that equates to 10% of an adult’s daily requirement.

Accordingly, up to five times less Omya Calcium Carbonate is required to meet the same calcium content and support any possible nutritional claim compared to other sources on the market.

Food grade Omya natural Calcium Carbonate meets both E170 and FCC standards

Benefits

- Excellent source of calcium
- Anti-caking agent
- Natural and calorie-free bulking agent
- Acts as a separating agent
- Adjusts pH value
- Provides CO₂ for improved leavening
- Generates whiteness and opacity
- Supports acrylamide reduction

PRODUCTS:

- Omya Calcipur®
- Omya-Cal®
- Omyabake®
Improving the Performance of Baked Goods

As real all-rounders, Omya minerals not only offer health benefits such as increasing calcium content, reducing acrylamide* and powder caking, but also have tailored properties that simplify production processes and improve formulations of baked products such as bread, tortilla and cake.

Calcium Carbonate in Bread Improvers

Bread improvers aim to boost the early fermentation of the bread dough, to improve the quality of the final bread as well as to extend the shelf-life. They are physical blends of dried yeast, enzymes, ascorbic acid and other ingredients (e.g. Calcium Carbonate), which have an impact on the bread production process. Calcium ions for instance affect the yeast fermentation and the gluten structure which are responsible for the quality of the bakery products.**

Typical bread improver mix containing Calcium Carbonate

<table>
<thead>
<tr>
<th>Ingredients*</th>
<th>Preferred Range</th>
<th>Quantity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascorbic Acid</td>
<td>2-25</td>
<td>19.84</td>
</tr>
<tr>
<td>Fungal α-amylase Concentrate</td>
<td>0.1 - 30</td>
<td>7.50</td>
</tr>
<tr>
<td>Potassium Bromate</td>
<td>0 - 25</td>
<td>11.30</td>
</tr>
<tr>
<td>Calcium Carbonate</td>
<td>0 - 50</td>
<td>15.00</td>
</tr>
<tr>
<td>Tricalcium Phosphate</td>
<td>1 - 10</td>
<td>3.00</td>
</tr>
<tr>
<td>Starch</td>
<td>to make up 100%</td>
<td>43.36</td>
</tr>
</tbody>
</table>

* Chang, Wang, Sung, 2014; Calcium salts reduce acrylamide formation and improve qualities of cookies

Improved Dough Elasticity

Moreover, the addition of Calcium Carbonate in tortillas based on corn or wheat flour show improved dough properties. The dough is more elastic and kneadable, which leads to a better processability.

1.7% Natural Calcium Carbonate increases elasticity of wheat tortillas

![Figure 1: Comparison of the dough elasticity (expressed in [BE] = Brabender Units) of wheat tortillas](image)

Test panels perceived a better taste profile in tortillas with Calcium Carbonate, describing it as less sour with a more balanced texture.

There was no negative impact on mouthfeel due to the controlled particle size of Omya food grade Calcium Carbonates.
A Non-hygroscopic Separating Agent for Baking Powders

Calcium Carbonate also acts as source of carbon dioxide during baking; thus improving the crumb structure, texture and volume of the finished baked products. Traditionally, baking powders are composed of a carbon dioxide source such as sodium bicarbonate, an acid source such as citric acid and a separating agent such as corn starch or Calcium Carbonate. Omya Calcium Carbonate is an efficient separating agent in sodium bicarbonate-based baking powder formulations regardless of the acid source used.
Baking Tests & Results

All-in-one cake mixes baked with sodium bicarbonate-based baking powder

Two different recipes, using Sodium Acid Pyrophosphate (SAPP) or citric acid as acidic components, were tested to compare the performance of corn starch, rice starch and Calcium Carbonate as separating agents.

Sodium bicarbonate was the source of carbon dioxide for the whole test series, in which standard all-in-one cake mixes were baked. According to the neutralization value of the acidic component, different amounts of separating agent were used, 23% for the citric acid-containing recipe and 41% for the SAPP 15-containing one. All separating agents performed equally well in all tested recipes.

Benefits

- Improved crumb structure
- Homogenous pore size distribution
- Provides CO₂ for improved leavening
Confectionary products are mostly rich in sugar, much of it usually in the form of a sugar coating on top. Yet, today’s consumers are becoming more health conscious and mindful in their dietary choices. Governments and institutions such as the World Health Organization (WHO) undertake various measures globally to limit sugar intake. A trend that is also pressuring manufacturers to reduce sugar content in end products.

Calcium Carbonate can be formulated into sugar coatings such as royal icing, fat glazing or vanilla frosting to reduce sugar and allow calorie reduction since it does not contribute to the caloric value of a food. Thus, it is a bulking agent that can allow a reduction in calories. Additionally, Calcium Carbonate acts both as a white pigment and as an opacifier.

Benefits

- Provides whiteness and opacity
- No calories
- Gives texture and bulk
- Non-hygrosopic
- Reduces sugar content

1 Gurr M.; Calcium in Nutrition, International Life Sciences Institute Europe Concise Monograph Series, 1999
Coating Tests & Results

Incorporating up to 35% Calcium Carbonate in sugar coatings is possible. This reduces the sugar content and allows for a significant calorie reduction. Omya Calcium Carbonates are bright white, non-hygroscopic and ideal bulking agents. Tailored particle sizes allow high concentrations without impacting the mouthfeel of the final product.

A replacement of 35% sugar and 1% titanium dioxide (TiO₂) with natural Calcium Carbonate leads to a calorie reduction from 310 to 174 kcal, and a preserved whitening effect².

Covering Power Test

A sugar-coating recipe containing no white pigments, titanium dioxide or Calcium Carbonate was spread on a contrast card and measured with a colorimeter to evaluate the covering power.

A cost-efficient replacement of sugar and sugar/ TiO₂ blends in coatings
Natural Calcium Carbonate in Fat Glazing – Taste & Mouthfeel

Compared to a reference without Calcium Carbonate, Omya Calcipur®-containing fat glaze was perceived as more milky. Independent of the particle size of the Calcium Carbonate, Omya Calcipur® provides a smoother and less astringent mouthfeel. Test results showed that 35% sugar reduction can be achieved without impacting the pH and water activity of the final product.
Pleasant Mouthfeel & Improved Taste

Thanks to its tailored particle size and outstandingly high-purity, baked products enriched with Omya natural Calcium Carbonate impress, not only with a pleasant mouthfeel and a great taste, but also with exceptional opacity and whiteness.

### Product Offer

<table>
<thead>
<tr>
<th>Product</th>
<th>Material type</th>
<th>Manufacturing site</th>
<th>Median particle size d50% (μm)</th>
<th>Loose bulk density (g/ml)</th>
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</thead>
<tbody>
<tr>
<td>Omya Calci pur® 110 - KP</td>
<td>Marble</td>
<td>Kemalpasa, Turkey</td>
<td>2.2</td>
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<tr>
<td>Omya Calci pur® 90 - KP</td>
<td>Marble</td>
<td>Kemalpasa, Turkey</td>
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<td>Omya Calci pur® 70 - KP</td>
<td>Marble</td>
<td>Kemalpasa, Turkey</td>
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<td>Omya Calci pur® 60 - KP</td>
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<td>Kemalpasa, Turkey</td>
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<td>Calci pur® 2 - OG</td>
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<td>Orgon, France</td>
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<td>Calci pur® 5 - OG</td>
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<tr>
<td>Omyabake® 50 - OG</td>
<td>Limestone</td>
<td>Orgon, France</td>
<td>7.0</td>
<td>0.80</td>
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<td>Omya-Cal® FG 4 - AZ</td>
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<td>Superior Arizona, USA</td>
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<td>Omya-Cal® FG 10 - AZ</td>
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<td>Superior Arizona, USA</td>
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<td>Marble</td>
<td>Superior Arizona, USA</td>
<td>15.0</td>
<td>0.88</td>
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</tbody>
</table>
Omya Consumer Goods

+41 62 789 29 29
info.food@omya.com

Omya International AG
CH-4665 Oftringen
www.omya.com

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