COMPOSITE MALTITOL POWDER

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Field of Search ............... 127/29, 30, 63; 426/213, 426/217

References Cited

UNITED STATES PATENTS


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ABSTRACT

A composite maltitol powder is prepared from core particles containing more than 50% maltitol coated with fine low hygroscopic sugar alcohol particles having a diameter less than one-half the diameter of the core particles.

8 Claims, No Drawings
COMPOSITE MALITOL POWDER

BACKGROUND OF THE INVENTION

1. Field of the Invention
The present invention relates to a low caking composite maltitol powder composed of core particles of maltitol coated with fine sugar alcohol particles, and the manufacture thereof.

2. Description of the Prior Art
Maltitol is a sugar alcohol having a sweet taste similar to that of sucrose. Recently, it has been found that maltitol is not absorbed by the digestive organs, and hence is important as a low caloric sweetening material. However, maltitol is difficult to crystallize and is highly hygroscopic, and therefore is difficult to use in powdered form. When maltitol or a maltitol-containing powder is exposed to the air, the powder immediately absorbs moisture, cakes and then forms a solution by dissolving in the water absorbed. Accordingly, the applications of maltitol have been quite limited even though maltitol has ideal characteristics as a low-calorie sweetening material.

A need exists therefore for a maltitol powder which will resist caking when exposed to the air.

SUMMARY OF THE INVENTION

Accordingly, one object of the present invention is to provide a low caking composite maltitol powder.

Another object of the invention is to provide a process for imparting low caking properties to maltitol powder.

These and other objects of the invention as will hereinafter become more readily understood can be attained by a powder of core particles containing more than 50% by weight maltitol coated with fine low hygroscopic sugar alcohol particles on the surface of the core particles.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the invention, the caking tendency of maltitol powder is reduced by coating the surface of the maltitol particles with fine low hygroscopic sugar alcohol particles.

The low caking maltitol powder of the invention is composed of core particles containing mainly maltitol and fine low caking sugar alcohol particles which, fine particles are bonded to the surface of the molten core particles.

The core particles may be pure maltitol, but usually contain more than 50 wt %, preferably more than 70 wt % maltitol, and another ingredient, such as sorbitol, hydrogenated oligosaccharides, hydrogenated dextrin, which lower the cost of the particles. When the content of maltitol in the core particles is less than 50 wt %, the low calorie characteristic of the product will be disadvantageously lost.

Suitable low hygroscopic sugar alcohols include sorbitol, mannitol, xylitol and hydrogenated dry starch syrup solids. Other sweetening materials, e.g., saccharin or the like, may be combined with the maltitol core particles or the fine sugar alcohol particles.

Core particles of 10–50 mesh, that is 100–4000 μm diameter, may be used, however, core particles having a diameter of 400–1700 μm are preferable because of ease of preparation and use of the particles. The diameter of the fine low hygroscopic sugar alcohol particles is preferably less than one-third, most preferably less than one-fifth of the core particles. Accordingly, 100 mesh low hygroscopic sugar alcohol particles are preferable, and those having a diameter of 40–170 μm are most preferable. When the ratio of the fine low hygroscopic sugar alcohol particles to the core particles is too high, the low calorie characteristic of the product will be lost. On the other hand, when the ratio is too low, the sugar particles will be present in insufficient amounts to prevent caking of the maltitol. Accordingly, a suitable ratio of fine sugar alcohol particles is usually 10–100 wt parts, preferably 15–55 wt parts, to 100 wt parts of core particles.

The low caking composite maltitol powder of the invention is composed of 100 wt parts of core particles containing more than 50%, preferably more than 70%, maltitol and having a diameter of 100–4000 μm, preferably 400–1700 μm, and 10–100 wt parts of fine low hygroscopic sugar alcohol particles having a diameter less than 170 μm, preferably 40–170 μm, coated onto the surface of the molten core particles.

The low caking composite maltitol powder may be prepared by mixing the core particles with the fine sugar alcohol particles in a mixer with heating, coating the fine sugar alcohol particles onto the surface of the molten core particles, and cooling the mixture to bond the fine sugar alcohol particles to the core particles. More particularly, a solution of maltitol containing more than 50%, preferably more than 70% total solid components is heated and condensed to give a molten product containing substantially no water. The molten product is cooled to form a block, is crushed in a dry atmosphere and is sifted to give core particles having a diameter of 100–4000 μm, preferably 400–1700 μm. The low hygroscopic sugar alcohol, such as sorbitol, mannitol or the like, is crushed, sifted and dried to give fine sugar alcohol particles having a diameter less than 170 μm, preferably 40–170 μm. A suitable amount of the maltitol core particles and the fine sugar alcohol particles are placed in a mixer, and are gradually heated with stirring. The ratio of the fine sugar alcohol particles is in the range of 30–100 wt parts, preferably 40–100 wt parts, to 100 wt parts of the maltitol core particles.

In general, the addition of an excess of fine sugar alcohol particles is preferable. The temperature used for the heating is dependent upon the type of low hygroscopic sugar alcohol, and is preferably lower than the softening temperatures of the sugar alcohol. In order to increase the amount of fine sugar alcohol particles coated onto the core particles, a relatively high temperature should be selected. Conversely, to decrease the amount of fine sugar alcohol particles coated onto the core particles, a relatively low temperature should be selected. The temperature is usually 40°–95°C, preferably 60°–80°C.

The mixture of particles is heated to the predetermined temperature and is continuously stirred at that temperature until the fine sugar alcohol particles are uniformly coated onto the surface of the molten core particles. The time required for the coating is dependent upon the temperature of the mixture of particles, and is usually in the range of 30–120 minutes. The stirring velocity is selected so as to give uniform and sufficient contact of the fine sugar alcohol particles with the maltitol core particles. When the stirring operation is continued, enough fine sugar alcohol particles are
coated onto the surface of the maltitol core particles to decrease tackiness and to improve fluidity. The heating is stopped at this stage, and the mixture is cooled and sifted to separate excess of fine sugar alcohol particles and give the composite maltitol powder. Excess fine sugar alcohol particles can be separated by sifting and can be recycled.

Suitable mixers used in the process of the invention include conventional fixed vessel mixers, rotary vessel mixers, and other mixers used for mixing and blending solid particles. A mixer whose inner temperature can be controlled is preferable. Suitable mixers include rotary cylindrical mixers, jacket cylindrical mixers, and the like.

The low caking composite maltitol powder will not cake when kept in air having a relative humidity of 59% and temperature of 37°C for 2 hours. On the other hand, conventional powders containing maltitol will cake within several minutes.

Having generally described the invention, a more complete understanding can be obtained by reference to certain specific examples, which are included for purposes of illustration only and are not intended to be limiting unless otherwise specified.

EXAMPLE 1

A 750 kg portion of an aqueous solution containing 75% solid component composed mainly of maltitol (75% maltitol, 5% sorbitol and 20% of a hydrogenated oligosaccharide higher than a trisaccharide alcohol) was condensed in a vacuum of 740-750 mm Hg at a maximum temperature of 115°C, to form a concentrate containing substantially no water. The concentrate was cooled, crushed with a hammer crusher and was sifted in air having a relative humidity of 40%, to obtain 10-30 mesh particles (500-1700 μ). A 200 kg amount of the resulting core particles containing maltitol and 40 kg of fine sorbitol particles of diameter less than 100 μ (passed through a 150 mesh sieve) were placed in a 1000 liter horizontal cylindrical mixer equipped with a jacket, and the mixture was heated to 60°C at a stirring rate of 10 r.p.m. After stirring 60 minutes with heating, the mixture was cooled to obtain 240 kg of a composite of the composite maltitol powder. The composite powder had an angle of repose of 36°, and contained 20 wt parts of hydrogenated starch syrup solids per 100 wt parts of core particles. Even though the composite powder was kept for more than 2 hours in an atmosphere with a relative humidity of 59% at 37°C, the fluidity of the composite powder did not decrease, and the composite powder did not cake.

Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made thereunto without departing from the spirit and scope of the invention as set forth herein.

What is claimed as new and intended to be covered by letters patent is:

1. A low caking composite maltitol powder which comprises:
   core particles containing more than 50% by weight of maltitol and a coating of fine low hygroscopic sugar alcohol particles having a diameter less than one-third of the diameter of the core particles.

2. The low caking composite maltitol powder of claim 1, wherein the low hygroscopic sugar alcohol is selected from the group consisting of sorbitol, mannitol, xylitol and hydrogenated starch syrup solids.

3. The low caking composite maltitol powder of claim 1, wherein the core particles have a diameter of 100-4000 μ, and the fine sugar alcohol particles have a diameter of less than one-third that of the core particles, in the range of 20-350 μ.

4. The low caking composite maltitol powder of claim 1, wherein the weight ratio of fine sugar alcohol particles to core particles is 10-100 : 100.

5. A process for preparing a low caking composite maltitol, which comprises: mixing 100 wt parts of core particles containing more than 50% by weight of maltitol and having a diameter of 100-4000 μ, with 10-200 wt. parts of fine sugar alcohol particles with a diameter less than one-third that of the core particles, heating the mixture with stirring at a temperature of 40°-95°C to coat the fine sugar alcohol particles onto the surface of the core particles, and cooling the product mixture.

6. The process of claim 5, wherein the sugar alcohol is selected from the group consisting of sorbitol, mannitol, xylitol and hydrogenated starch syrup solids.

7. The process of claim 5, wherein excess fine sugar alcohol particles, which are not bonded onto the surface of the core particles, are separated from the product mixture.

8. The process of claim 5 which further comprises: concentrating and cooling an aqueous solution containing maltitol to form a solid block, crushing said block and sifting the resulting particles having a diameter of 100-4000 μ, mixing sugar alcohol particles with said crushed and sifted particles having a diameter less than one-third that of said crushed and sifted particles with stirring at a temperature of 40°-95°C to form a product mixture, cooling the product mixture; and separating excess sugar alcohol particles from said product mixture.
UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,915,736
DATED : November 28, 1975
INVENTOR(S) : Koichi Oyamada, Seiji Hashimoto, Kazuaki Kuno, and Yasubumi Hirabayashi

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Change Assignee from "Nikken Checicals Co., Ltd." to --Nikken Chemicals Co., Ltd.--.

Signed and Sealed this sixteenth Day of March 1976

[SEAL]

Attest:

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