METHOD FOR PREPARING EXPANDED SNACK PARTICLES

Inventors: Henk-Jan Meijer, Apeldoorn (NL); Rudy Mathias H. Heijmans, Westervoort (NL)

Correspondence Address:
BANNER & WITCOFF, LTD.
28 STATE STREET
28th FLOOR
BOSTON, MA 02109-9601 (US)

Assignee: Nederlandse Organisatie Toegesp. Natuurwetenschappelijk Onderzoek TNO, Delft (NL)

Appl. No.: 11/851,597
Filed: Sep. 7, 2007

The invention provides a method for preparing expanded snack particles, in which method pre-formed semi-finished starch-containing snack particles are contacted with superheated steam having a flow rate in the range of from 1 to 40 m/s, at a temperature in the range of from 150-300° C., until the semi-finished snack particles have expanded, and wherein more than 75% of the surface of the semi-finished starch-containing snack particles is contacted with the superheated steam. The invention further provides expanded snack particles obtainable with said method.

Publication Classification
Int. Cl. A23P 1/14 (2006.01)
A21D 13/00 (2006.01)

U.S. Cl. 426/559; 426/496; 426/498

ABSTRACT
METHOD FOR PREPARING EXPANDED SNACK PARTICLES

RELATED APPLICATIONS

[0001] This application is a continuation of PCT application no. PCT/NI.2006/000128, designating the United States and filed Mar. 10, 2006; which claims the benefit of the filing date of European application no. EP 05075585.9, filed Mar. 10, 2005; each of which is hereby incorporated herein by reference in its entirety for all purposes.

FIELD

[0002] The present invention relates to a method for preparing expanded snack particles, and expanded snack particles obtainable by said method.

BACKGROUND

[0003] Many snack particles are prepared from preformed semi-finished starch-containing snack particles, so-called pellets. These pellets have a long shelf-life and are normally prepared by passing a mixture of ingredients including starch and water through a cooking extruder where the mixture is cooked and formed into a dense semi-finished product. The particles so obtained will be allowed to dry to ensure a long shelf-life and an even moisture distribution. Finished snack particles are usually prepared by the industry by deep-frying the semi-finished snack product in oil whereby expanded snack particles are obtained. A disadvantage of the snack particles so prepared is that they have a high fat content because the semi-finished snack particles absorb a substantial amount of oil during the finish-frying process, which is from health perspective most undesirable. Alternatively the industry uses hot air to expand snacks and obtain low fat content products. However, the expansion of snacks in hot air does not lead to uniformly expanded products for most snack formulations. The texture is hard and edges are coloured too dark. In addition a process with hot air uses very much energy.

SUMMARY

[0004] The object of the present invention is to provide a method for preparing expanded snack particles which constitute both from health and expansion perspective an improvement over the known processes.

DETAILED DESCRIPTION OF CERTAIN PREFERRED EMBODIMENTS

[0005] Accordingly, the present invention relates to a method for preparing expanded snack particles, in which method pre-formed semi-finished starch-containing snack particles are contacted with superheated steam having a flow rate in the range of from 1 to 40 m/s, at a temperature in the range of from 150-300° C., until the semi-finished snack particles have expanded, and wherein more than 75% of the surface of the semi-finished starch-containing snack particles is contacted with the superheated steam.

[0006] The expanded snack particles prepared in accordance with the present invention have a very low fat content whilst in addition they display an excellent expansion capacity in the sense that raw edges can in essence be avoided.

[0007] The semi-finished starch-containing snack particles will be contacted with the superheated steam until the semi-finished particles have been expanded.

[0008] The water content of the pre-formed semi-finished starch-containing snack particles may vary considerably. Suitably, the water content of the semi-finished snack starch-containing snack particles is in the range of from 1 to 25 wt %, based on total weight of the semi-finished snack particles. Preferably, the semi-finished snack particles have a water content of 2 to 20 wt %, more preferably 3 to 15 wt %, and most preferably 5 to 13 wt %, based on total weight of the semi-finished snack particles.

[0009] The pre-formed semi-finished starch-containing snack particles will usually be made from a material which comprises starch and water. Suitably, the starch can be selected from the group consisting of potato, maize, tapioca, rice, corn starch or any mixture thereof. The material may in addition comprise ingredients such as salt, herbs, flavourings, colour additives, spices, sugar, and so forth.

[0010] The pre-formed semi-finished snack particles to be used in accordance with the present invention suitably comprises 20-90 wt % of a starch, preferably in the range of from 25 to 70 wt %, based on total semi-finished snack product.

[0011] The pre-formed semi-finished snack particles to be used in accordance with the present invention can be chosen from a variety of snack products. Suitable potato sticks, potato twists or tubes, corn curls. Potato sticks and potato twists or tubes will usually comprise potato powder, potato flour or potato grits in an amount in the range of from 25-70 wt %, based on total weight of the semi-finished snack particles, and a food grade potato starch that is suitable for expanded snack particles in an amount in the range of from 20-70 wt %, based on total weight of semi-finished snack particles. Minor ingredients can be salt in an amount in the range of from 0-2 wt %, based on total weight of the semi-finished snack particles, and other technical additives such as, for example, modified starch. Pellets of such mixtures can suitably be formed in an extruder or press, and subsequently dried to an appropriate moisture content which usually ranges from 8-12 wt %. The final snack particles, i.e. the expanded snack particles will be prepared in a superheated steam process. Seasonings and oil can be added to the semi-finished snack particles at the consumer’s desire.

[0012] The base formulation of corn-based semi-finished snack particles in accordance with the present invention suitably comprises corn flour, corn grits or corn powder in an amount in the range of from 25-100 wt %, based on total weight of semi-finished snack particles. The corn material can suitably be mixed with a potato, corn or wheat starch. Such semi-finished snack particles may suitably comprise 25-100 wt % of a corn material and 0-75 wt % of a starch material 0-75%, both based on total weight of semi-finished snack particles. In addition, wheat flour may suitably be added in an amount in the range of from 0-20 wt %, based on total semi-finished snack particles. Wheat starch, wheat flour, rice flour and rice starch can also suitably be used in snack formulations. Mixtures that comprise such materials can be pelletized or pressed. Such mixtures can suitably be combined with shrimp or soy ingredients to prepare typical Asian type snack products.
The pre-formed semi-finished snack particles to be used in accordance with the present invention may have any desired shape. Suitable shapes include lattices, wheels, sheets or any fantasy figures.

The present invention can also suitably be applied to either fresh cut or semi-finished potato particles, with a moisture content less than 85%.

The present invention also relates to snack particles obtainable by the method according to the present invention. Such a snack product has the advantage that it expands in a homogeneous manner when it is contacted with the superheated steam. In addition, the shelf life of the snack product is advantageously extended. Further, the final oil content of the snack particles can attractively controlled by the industry who can add desired amounts of oil and seasoning. The above advantages are clearly not perceived with snack pellets that have been industrially deep-fat fried, expanded and bagged.

The pre-formed semi-finished snack particles to be used in accordance with the present invention can suitably be stored in a container such as a package or bag made of a moisture-protective foil. Suitably, the container is also air-tight. In order to allow one to monitor the progress of the finishing process the container is suitably fully or partly transparent.

The expanded snack particles obtained with the method according to the present invention display excellent properties in terms of texture, colour, and taste. Another advantage of the present method is its positive effect on the environment since odour nuisance related to finish frying with oils will be considerably reduced, and waste oils will no longer be generated. Yet another advantage of the present invention is that the expanded snack particles obtained with the present method have a low fat content which has a positive influence on the health of consumers, resulting in, for instance, less obesity and cardiovascular related diseases. Further, it also avoids the use of deteriorated oils, which has an impact on the quality of the finished snack particles to be consumed. In respect of, for instance, shrimp crackers, it is also observed that the finish-fried shrimp crackers prepared in accordance with the present invention display a more intense fish flavour when compared with those obtained by known methods. This means that in accordance with the present invention shrimp crackers can be finish-fried that have a lower shrimp content, which allows a significant reduction in the costs of raw material. In addition, the cholesterol content of the finish-fried product is considerably reduced which obviously has a positive impact on the health of consumers.

Preferably, in accordance with the present method the pre-formed semi-finished starch-containing snack particles are contacted with a gaseous medium comprising at least 50 volume % of superheated steam. More preferably, the gas comprises more than 90 volume % of superheated steam, based on total gas.

Preferably, the method according to the present invention is carried out in such a way that more than 90% of the surface of the pre-formed semi-finished starch-containing snack particles is contacted with the superheated steam. More preferably, more than 95% of the surface of the pre-formed semi-finished snack particles is contacted with the superheated steam, and most preferably the complete or essentially complete surface of the pre-formed semi-finished particles is contacted with the superheated steam.

The contact between the surface of the pre-formed semi-finished snack particles and the superheated steam can be established in different ways. This can, for example, be established by way of fluidisation.

In other attractive embodiments of the present invention this can be established by carrying out the present method in a rotary drum or carrying it out on a sieve belt or vibrating screen.

Suitably, the pre-formed semi-finished particles to be finish-fried in accordance with the present invention have a moisture content of less than 90%, preferably of less than 75%, and more preferably of less than 70%.

The pre-formed semi-finished snack particles that can suitably finish-fried in accordance with the present invention include shrimp crackers, rice crackers, cassava crackers, soya crackers, extruded snacks, corn snacks, and cereals snacks.

The flow rate of the superheated steam is within a broad range. Suitably, the flow rate of the superheated steam is in the range of from 1 to 40 m/s, more preferably in the range of from 10 to 20 m/s.

The method of the present invention is preferably carried out at a temperature in the range of from 150 to 300°C., and more preferably in the range of from 175 to 220°C.

The method according to the present invention is carried for a period of time in the range of from 10 seconds to 20 minutes. Preferably, the present method is carried out for a period of time in the range of from 20 seconds to 2 minutes, more preferably for a period of time in the range of from 30 to 60 seconds.

Suitably, in accordance with the present invention the part of the surface of the pre-formed semi-finished snack particles that is contacted with the superheated steam is contacted with the steam for more than 75% of the period of time, preferably more than 90% of the period of time, more preferably more than 95% of the period of time, and most preferably for the complete or essentially complete period of time.

Suitably, the method in accordance with the present invention is carried out at a pressure in the range of from 0.1 to 10 bara, preferably at a pressure in the range of from 0.9 to 1.1 bara.

The pre-formed semi-finished snack particles to be finish-fried with the present method suitably have a fat content in the range of from 0% to 10%, preferably in the range of from 0% to 1%. The expanded snack particles to be obtained in accordance with the present invention suitably have a fat content in the range of from 0% to 10%, preferably in the range of from 0% to 1%.

The present invention also relates to expanded snack particles obtainable with the method according to the present invention. Such snack particles display unique properties in terms of taste, crispiness, mouth feel and low fat content. Suitable examples of these snack particles include shrimp crackers, rice crackers, cassava crackers, soya crackers, extruded snacks, corn snacks, and cereals snacks.
EXAMPLES

Example 1

Shrimp Crackers

Non-fried shrimp crackers (Krupuk Udang Sidoardjo, imported by B.V. Lucullus, Leiderdorp) were fried in superheated steam. The crackers were placed in a perforated basket, in such a manner that there was no surface contact between the nuggets. The basket was then placed in a steam vessel and essentially the complete surface of the crackers was contacted with superheated steam for a certain period of time. The best results were obtained with the following steam conditions: steam temperature of 190°C, steam pressure of 1 bar(a), steam flow of 5 m/s and frying time of 30 seconds. The shrimp crackers so obtained were very crispy and both the fish taste and smell were clearly improved over the oil-fried crackers (30 seconds, 190°C). In addition, the mouth feel was less fatty when compared with the oil-fried crackers. The colour of the steam-fried crackers was much more homogenous than the colour of the oil-fried crackers, due to the fact that the oil-fried crackers were not completely submerged in oil due to the low specific gravity of the crackers.

Example 2

Extruded Snack Food

Extruded snack pellets (dry content: 44% potato flour, 50% potato starch, 2% salt, 4% additives) were fried in superheated steam. The pellets were placed in a perforated basket, in such a manner that there was no surface contact between the pellets. The basket was then placed in a steam vessel and essentially the complete surface of the pellets was contacted with superheated steam for a certain period of time. The best results were obtained with the following steam conditions: steam temperature of 190-200°C, steam pressure of 1 bar(a), steam flow of 5 m/s and frying time of 30 seconds. The pellets were very crispy, only slightly less crispy than the oil-fried pellets. Both taste and smell were clearly less fatty than those of the oil fried pellets (30 seconds, 190°C). The surface of the steam-fried pellets was clearly smoother than the surface of the oil-fried pellets, which contained blisters.

Example 3

Extruded Snack Food

Extruded snack pellets (dry content: 44% potato flour, 50% potato starch, 2% salt, 4% additives) were fried in superheated steam. The pellets were placed in a perforated basket, in such a manner that there was no surface contact between the pellets. The basket was then placed in a steam vessel and essentially the complete surface of the pellets was contacted with superheated steam for a certain period of time. The best results were obtained with the following steam conditions: steam temperature of 200°C, steam pressure of 1 bar(a), steam flow of 9 m/s and frying time of 60 seconds. The steam expanded pellets had a much higher expansion ratio than the oil expanded pellets. The pellets in steam expanded from 2.6 mm diameter to 5.3 mm (103% increase), while pellets in oil expanded from 2.6 to 4.4 mm (70% increase).

1. A method for preparing expanded snack particles, in which method pre-formed semi-finished stach-containing snack particles are contacted with superheated steam having a flow rate in the range of from 1 to 40 m/s, at a temperature in the range of from 150-300°C, until the semi-finished snack particles have expanded, and wherein more than 75% of the surface of the semi-finished stach-containing snack particles is contacted with the superheated steam.

2. The method according to claim 1, wherein more than 90% of the surface of the semi-finished snack particles is contacted with the superheated steam.

3. The method according to claim 2, wherein more than 95% of the surface of the semi-finished snack particles is contacted with the superheated steam.

4. The method according to claim 3, wherein the complete or essentially complete surface of the snack particles is contacted with the superheated steam.

5. The method according to claim 1, wherein the part of the surface of the semi-finished snack particles that is contacted with the superheated steam is contacted with the steam for more than 75% of the period of time.

6. The method according to claim 5, wherein the part of the surface of the semi-finished snack particles is contacted with the superheated steam is contacted with the steam for more than 90% of the period of time.

7. The method according to claim 6, wherein the part of the surface of the semi-finished snack particles that is contacted with the superheated steam is contacted with the steam for the complete or essentially complete period of time.

8. The method according to claim 1, wherein the contact between the semi-finished snack particles and the superheated steam is established by way of fluidisation.

9. The method according to claim 1, which is carried out in a rotary drum.

10. The method according to claim 1, which is carried out on a sieve belt.

11. The method according to claim 1, which is carried out on a vibrating screen.

12. The method according to claim 1, wherein the semi-finished snack particles have a moisture content of less than 20%.

13. The method according to claim 1, wherein the flow rate of the superheated steam is in the range of from 10 to 20 m/s.

14. The method according to claim 1, wherein the temperature is in the range of from 175 to 220°C.

15. The method according to claim 1, wherein the period of time is in the range of from 20 seconds to 2 minutes.

16. The method according to claim 1, which is carried out at a pressure in the range of from 0.1 to 10 bar.

17. The method according to claim 1, wherein the semi-finished starch-containing snack particles are contacted with a gas comprising at least 50 volume % of superheated steam, based on total gas.

18. The method according to claim 1, wherein the semi-finished snack particles have a fat content in the range of from 0 to 15%.

19. Expanded snack particles obtainable with a method according to claim 1.