

PROCESSED CHEESE AND PREPARATION METHOD THEREFOR

Technical Field

The present disclosure relates to the technical field of milk product processing, and particularly to a processed cheese and a preparation method therefor.

Background Art

Mozzarella cheese has become the fastest growing cheese type on the market currently. With the promotion of pizza, mozzarella cheese consumption has increased significantly. Due to the long production cycle of natural cheese, the inability to process whey, and supply chain obstruction, the processed mozzarella cheese has gradually replaced natural mozzarella cheese. In the national standard for processed cheese, GB 25192-2010, issued in 2010, the total number of colonies is ≤ 100 CFU/g, which is the most strict standard for cheese currently, but there is no relevant technical reference on how to achieve this standard. As a result, the processed cheese can only be produced simply and crudely by a UHT sterilization process. For the processed mozzarella cheese, in order to achieve the baking functionality (melting property, grease exudation, and drawing property) of natural mozzarella cheese, the sterilization temperature is typically in a range from 75°C to 80°C, and the maximum temperature cannot be higher than 85°C. Meanwhile, due to the product properties, the cheese has been kneaded into a dough at the sterilization temperature, which has the disadvantages of slow heat transfer, uneven heating, and insufficient sterilization effect. Thus, in the practical production and conversion, there is a risk that the total number of colonies exceeds 50 CFU/g, or even exceeds 100 CFU/g. Therefore, there is a need for further studying the process of preparing a processed cheese.

Contents of the Invention

In view of the problems in the prior art, one object of the present disclosure is to provide a method which can both guarantee the quality of the processed cheese, and achieve effective sterilization.

In order to achieve this object, the technical solutions of the present disclosure are as follows.

In a first aspect, the present disclosure provides a method for preparing a processed cheese, sequentially comprising steps of:

mixing remaining components in a raw material except for sodium citrate to obtain a premix, wherein the raw material comprises a cheese, an oil raw material, an enzymatic casein and an emulsifying salt, and the emulsifying salt comprises disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate;

sterilizing the premix; and

adding sodium citrate to the sterilized premix for full emulsification.

According to certain preferred embodiments, the sterilizing comprises heating the premix to 75-80°C in 100-150 seconds.

According to certain preferred embodiments, a mass ratio of the disodium hydrogen phosphate, the sodium hexametaphosphate and the sodium citrate is (5-8):(1-2):(3-4).

According to certain preferred embodiments, a mass ratio of a sum of protein in the cheese and protein in the enzymatic casein to a sum of fat in the cheese and fat in the oil raw material is 1:(1.2-1.5).

According to certain preferred embodiments, the oil raw material comprises a low melting point fat and optionally a high melting point fat, and a mass of fat in the low melting point fat accounts for 60%-80% by mass of a total fat, wherein the total fat refers to a sum of fat in the cheese and fat in the oil raw material, the high melting point fat has a melting point in a range from 32°C to 42°C, and the low melting point fat has a melting point in a range from 0°C to

30°C.

According to certain preferred embodiments, the cheese has a ripening period in a range from 0 to 1 month.

According to certain preferred embodiments, the high melting point fat is one or more selected from a group consisting of 33°C palm oil, butter, anhydrous milk fat and shortening.

According to certain preferred embodiments, the low melting point fat is 24°C palm oil and/or coconut oil.

According to certain preferred embodiments, the method comprises steps of:

- (1) mixing the enzymatic casein, the disodium hydrogen phosphate, the sodium hexametaphosphate and water to obtain a mixture 1;
- (2) mixing the oil raw material with the mixture 1 to obtain a mixture 2;
- (3) mixing remaining materials in the raw material except for sodium citrate with the mixture 2 to obtain the premix;
- (4) sterilizing the premix; and
- (5) mixing the premix with the sodium citrate.

According to certain preferred embodiments, in step (1), water, the enzymatic casein, the disodium hydrogen phosphate and the sodium hexametaphosphate are mixed while stirring at a stirring speed of 60-80 rpm and a water temperature of 35-40°C, wherein water is added into the mixture system at a rate of 8-10% of total amount of formulation per minute, and the stirring is stopped after addition of water.

According to certain preferred embodiments, in step (2), the oil raw material is heated to 40 - 45°C, and then mixed with the mixture 1 with stirring at a rotation speed of 60-80 rpm for 2-3 min to obtain the mixture 2.

According to certain preferred embodiments, in step (3), the remaining materials in the raw material except for sodium citrate are mixed with the mixture 2 with stirring at 80-100 rpm for 4-5 min to obtain the premix.

According to certain preferred embodiments, in step (5), the sodium citrate is dissolved by water at 90°C or above, and then mixed with the sterilized premix at 75-80°C at a rotation speed of 40-60 rpm for 3-5 min.

According to certain preferred embodiments, after step (5), the method further comprises a step of cooling to 0°C or below in 20 min - 40 min.

According to certain preferred embodiments, the raw material further comprises one or more selected from a group consisting of a salt, citric acid, a skim milk powder, a preservative, an edible essence, and a colorant.

According to certain preferred embodiments, the raw material comprises: 15-20 parts by weight of the cheese, 15-22 parts by weight of the oil raw material, 16-18 parts by weight of the enzymatic casein, 0.5-0.8 parts by weight of the disodium hydrogen phosphate, 0.1-0.2 parts by weight of the sodium hexametaphosphate and 0.3-0.4 parts by weight of the sodium citrate, and optionally comprises 0.5-0.8 parts by weight of the salt, 0.3-0.5 parts by weight of the citric acid, 0.5-1.0 parts by weight of the skim milk powder, 0.05-0.1 parts by weight of the preservative, 0.05-0.2 parts by weight of the edible essence, and 0.01-0.05 parts by weight of the colorant.

In a second aspect, the present disclosure provides a processed cheese obtained by the method for preparing a processed cheese as described hereinabove.

The present disclosure at least achieves the following advantages.

The national standard stipulation for the total number of microbial colonies of a processed cheese presents a new challenge to the practical mass production in factories. In view of the problem, the inventors of the present disclosure have extensively studied the process for a processed cheese, and make the emulsifying site of the dough formed in the process as close as possible to the site where it reaches the sterilization temperature by changing the way of adding emulsifying salts, preferably further in combination with the adjusted formulation of the processed cheese, such that the product obtained can not only achieve the baking functionality of the natural mozzarella cheese,

but also meet the microbial standard stipulated in the Chinese national standard. This avoids the risk of exceeding the standard in mass production and provides a reliable solution for practical industrial production.

Description of Drawings

Fig. 1 is a diagram showing the status of the products in Example 1 and Comparative Example 2 in the present disclosure.

Fig. 2 is a diagram showing the status of the product in Comparative Example 4 in the present disclosure.

Specific Embodiments

The inventors have carried out investigation and found that it is very difficult for the current sterilization processes to meet the limit of the total number of microbial colonies in GB 25192-2010 while guaranteeing the quality of processed cheese. To this end, it is found after exploration that if the way of adding emulsifying salts in a conventional processed cheese is changed, it is helpful to achieve the ideal sterilization effect while guaranteeing the quality of the processed cheese.

Specifically, in the present disclosure, multiple emulsifying salts, which are conventionally added together to achieve a coordinated and balanced emulsifying effect, are divided into two portions depending on their properties, and are separately added in different process steps. Particularly, it is selected to first mix disodium hydrogen phosphate and sodium hexametaphosphate with protein and an oil raw material, carry out sterilization, and then add sodium citrate for full emulsification. This process can not only fully mix protein and the oil raw material, but also shift the timing of the materials to form a chewy dough which is not easy to transfer heat. Before reaching the sterilization temperature, the premix has not been formed into a chewy dough, which minimizes the viscosity of the materials, enhances the flowability, and improves the heat

transfer. This can make subsequent sterilization more efficient and complete, ensuring that the microorganisms of the product meet the national standard and there is no risk of exceeding the standard in mass production. Meanwhile, this can also prevent the oil-water separation or protein aggregation of the materials when they are heated, guaranteeing the quality of the processed cheese.

Specifically, the present disclosure provides a method for preparing a processed cheese, wherein the raw material comprises: a cheese, an oil raw material, an enzymatic casein and an emulsifying salt which is composed of disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate. In preparation, remaining components except for sodium citrate are first mixed to obtain a premix, the premix then is sterilized, and then sodium citrate is added for full emulsification.

That is, the present disclosure provides a method for preparing a processed cheese, sequentially comprising steps of:

mixing remaining components in a raw material except for sodium citrate to obtain a premix, wherein the raw material comprises a cheese, an oil raw material, an enzymatic casein and an emulsifying salt, and the emulsifying salt comprises disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate;

sterilizing the premix; and

adding sodium citrate to the sterilized premix for full emulsification.

In the method of the present disclosure, the sterilizing comprises heating the premix, preferably with a steam, to 75-80°C in 100-150 seconds.

In the present disclosure, the use of the above sterilization process in combination with the effect obtained after mixing disodium hydrogen phosphate, sodium hexametaphosphate and the protein-containing raw material can avoid early emulsification and shaping of the materials, which will influence the effect of subsequent sterilization, while ensuring continuous process. If the heating time is less than 100 s, too high steam pressure will be

needed. In case of large amount of steam, it is easy to form a scorched paste near the steam nozzle, making continuous production impossible.

In the method of the present disclosure, a mass ratio of the disodium hydrogen phosphate, the sodium hexametaphosphate and the sodium citrate is (5-8):(1-2):(3-4).

The structure and properties of the processed mozzarella cheese depend largely on the selection and proportion of the emulsifying salt. In the present disclosure, by using specific composition of the emulsifying salt, a suitable emulsifying curve is built, which postpones the optimum emulsification position, thereby ensuring the flowability and heat transfer of the materials before reaching the sterilization temperature.

In the present disclosure, a mass ratio of the emulsifying salt (i.e., disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate) to a sum of protein in the cheese and protein in the enzymatic casein is (0.9-1.3):18.

In the method of the present disclosure, a mass ratio of a sum of protein in the cheese and protein in the enzymatic casein to a sum of fat in the cheese and fat in the oil raw material is 1:(1.2-1.5).

Preferably, the oil raw material comprises a low melting point fat and optionally a high melting point fat, and a mass of fat in the low melting point fat accounts for 60%-80% by mass of a total fat, wherein the total fat refers to a sum of fat in the cheese and fat in the oil raw material, the high melting point fat has a melting point in a range from 32°C to 42°C, and the low melting point fat has a melting point in a range from 0°C to 30°C.

Preferably, the cheese has a ripening period of 0-1 month to ensure the number of complete casein, thereby ensuring the baking functionality. The ripening of the cheese is performed under refrigeration, at a refrigerating temperature of 2-8°C.

Preferably, the high melting point fat is one or more selected from a group consisting of 33°C palm oil, butter, anhydrous milk fat and shortening.

Preferably, the low melting point fat is 24°C palm oil and/or coconut oil.

The 33°C palm oil, the anhydrous milk fat, the shortening, the 24°C palm

oil and the coconut oil all have a fat content of 100%, and the butter has a fat content $\geq 80\%$.

In the present disclosure, by adjusting the protein-fat ratio and matching the proportions of the materials of high melting point fat and low melting point fat, not only the properties of the processed cheese can be guaranteed, but also the materials can better cooperated with the specific emulsifying salt step by step, so that the timing of shaping can be postponed, ensuring the heat transfer of the materials before sterilization.

In the present disclosure, preferably, the cheese has a protein content of 22-25% and a fat content of 25-30%. The enzymatic casein has a protein content of 80-82%.

A mass ratio of the cheese to the enzymatic casein is 1: (0.6-1.4). If the oil raw material comprises a high melting point fat, a mass ratio of the cheese to the high melting point fat is 1:(0.1-0.4).

Preferably, the mass ratio of the cheese to the enzymatic casein is 1:(0.8-1.2). If the oil raw material comprises a high melting point fat, a mass ratio of the cheese to the high melting point fat is 1:(0.1-0.25), so as to not only guarantee the flavor and properties of the processed cheese, but also to cooperate with other materials of the present disclosure to achieve an ideal timing of shaping.

The selected cheese is a frozen cheese, typically a curd or a frozen cheddar.

The method of the present disclosure steps of:

- (1) mixing the enzymatic casein, the disodium hydrogen phosphate, the sodium hexametaphosphate and water to obtain a mixture 1;
- (2) mixing the oil raw material with the mixture 1 to obtain a mixture 2;
- (3) mixing remaining materials except for sodium citrate with the mixture 2 to obtain the premix;
- (4) sterilizing the premix; and
- (5) mixing the premix with the sodium citrate.

The remaining materials refer to cheese, and other components which may be added to the processed cheese, such as a salt, citric acid, a skim milk

powder, a preservative, an edible essence, and a colorant.

Preferably, in step (1) of the method of the present disclosure, water, the enzymatic casein, the disodium hydrogen phosphate and the sodium hexametaphosphate are mixed while stirring at a stirring speed of 60-80 rpm and a water temperature of 35-40°C, wherein water is added into the mixture system at a rate of 8-10% of total amount of formulation per minute, and the stirring is stopped after addition of water.

Preferably, in step (2) of the method of the present disclosure, the oil raw material is heated to 40 - 45°C, and then mixed with the mixture 1 with stirring at a rotation speed of 60-80 rpm for 2-3 min to obtain the mixture 2.

Preferably, in step (3) of the method of the present disclosure, the remaining materials except for sodium citrate are mixed with the mixture 2 with stirring at 80-100 rpm for 4-5 min to obtain the premix.

Preferably, in step (5) of the method of the present disclosure, the sodium citrate is dissolved by water at 90°C or above, and then mixed with the sterilized premix at 75-80°C at a rotation speed of 40-60 rpm for 3-5 min.

Preferably, after step (5) of the method of the present disclosure, the method further comprises a step of cooling to 0°C or below in 20 min - 40 min (as quickly as possible).

In the present disclosure, by slowly mixing the water ingredient with the enzymatic casein at a constant rate in step (1), the uneven heating due to agglomeration can be avoided. If the water ingredient is added at a rate less than 8-10%/min, the material mixing time will be prolonged, resulting in reduced production efficiency. If the water ingredient is added at a rate greater than 8-10%/min, there will be an agglomeration in the semi-finished cheese piece, and the detected microorganisms in the agglomeration will exceed 5000 CFU/g.

The temperatures are coordinated with the mixing speeds in the remaining steps to achieve full and efficient mixing of the materials, thereby ensuring the uniformity of the product.

In the method of the present disclosure, the raw material further comprises

one or more selected from a group consisting of a salt, citric acid, a skim milk powder, a preservative, an edible essence, and a colorant.

In the present disclosure, the skim milk powder is used to introduce lactose so as to incur the Maillard reaction in baking to cause browning, wherein the skim milk powder has a protein content of 32-33%.

It can be selected by those skilled in the art to add a preservative, an edible essence, a colorant and so on depending on the common knowledge in the art and the application requirements. For example, the preservative may be added according to the requirements in the national standard, wherein the preservative may comprise one or any combination of sorbic acid, potassium sorbate, nisin and natamycin. The colorant is β -carotene.

In the method of the present disclosure, the raw material comprises: 15-20 parts by weight of the cheese, 15-22 parts by weight of the oil raw material, 16-18 parts by weight of the enzymatic casein, 0.5-0.8 parts by weight of the disodium hydrogen phosphate, 0.1-0.2 parts by weight of the sodium hexametaphosphate and 0.3-0.4 parts by weight of the sodium citrate, and optionally comprises 0.5-0.8 parts by weight of the salt, 0.3-0.5 parts by weight of the citric acid (for adjusting the pH value of the processed cheese to 5.7-6.1), 0.5-1.0 parts by weight of the skim milk powder, 0.05-0.1 parts by weight of the preservative, 0.05-0.2 parts by weight of the edible essence, and 0.01-0.05 parts by weight of the colorant.

The formulation of the present disclosure can guarantee the flavor of the processed cheese, and achieve the design for the timing of emulsification and shaping in production process.

The present disclosure also provides a processed cheese obtained by the method for preparing a processed cheese as described hereinabove.

Examples

The preferred embodiments of the present disclosure will be described in detail below with reference to the Examples. It should be appreciated that the following Examples are given only for the purpose of description, but not

intended to limit the scope of the present invention. Those skilled in the art can make various modifications and replacements without departing from the purpose and spirit of the present invention.

The experimental methods used in the following Examples are all conventional methods unless specifically indicated otherwise. The materials, reagents and so on used in the following Examples are all commercially available unless specifically indicated otherwise.

Examples 1-3

The present examples each provide the processed cheese of the present disclosure and a preparation method therefor.

A part of the formulations is shown in Table 1, where % represents a mass percentage, and the balance of the formulation is water. In each example, the amount of the edible salt added was 0.8%, the amount of citric acid added was 0.4%, the amount of the skim milk powder added was 0.5%, the amount of the preservative (sorbic acid) added was 0.05%, the amount of the edible essence added was 0.1%, and the amount of the colorant (β -carotene) added was 0.02%.

Here, the cheese was a frozen cheddar cheese (which was ripened for 0 month), and had a protein content of 25% and a fat content of 30%. The enzymatic casein had a protein content of 80%. The total fat refers to a sum of fat in the cheese and fat in the oil raw material (comprising a high melting point fat and a low melting point fat). The protein-fat ratio refers to an amount ratio of a sum of protein in the cheese and protein in the enzymatic casein to a sum of fat in the cheese and fat in the oil raw material. The skim milk powder had a protein content of 32%.

Table 1

Raw materials	Example 1	Example 2	Example 3
cheese	15%	20%	15%
enzymatic casein	17.81%	16.25%	17.81%
high melting point fat	no addition	anhydrous milk fat 4.8%	33°C palm oil 2.5%

low melting point fat	24°C palm oil 17.3%	coconut oil 16.2%	24°C palm oil 16.4%
proportion of fat in low melting point fat to total fat	79.36%	60%	70%
protein-fat ratio	1.2	1.5	1.3
disodium hydrogen phosphate	0.5%	0.8%	0.6%
sodium hexametaphosphate	0.1%	0.15%	0.2%
sodium citrate	0.3%	0.35%	0.4%

The particular preparation method comprised steps as follows:

1. adding the enzymatic casein, disodium hydrogen phosphate, and sodium hexametaphosphate into a twin screw digester, adding the ingredient water at 40°C at a rate of 10%/min while starting stirring at a stirring speed of 80 rpm, and stopping stirring after the addition of water to obtain a mixture 1;
2. heating the oil raw material to 45°C, and stirring it with the mixture 1 at a rotation speed of 80 rpm for 3 min to obtain a mixture 2;
3. adding the cheese and the remaining materials except for sodium citrate into the mixture 2, and stirring at a speed of 80 rpm for 5 min to obtain a mixture 3 (a premix);
4. heating the mixture 3 to 80°C with a steam over 150 s to obtain a mixture 4;
5. dissolving sodium citrate with a small amount of the ingredient water at 90°C, adding the solution into the mixture 4, and stirring at 80°C at a rotation speed of 60 rpm for 4 min to obtain a mixture 5; and
6. filling the mixture 5 into a mold for shaping, cooling it to 0°C or below over 40 min, and cutting it into various sizes as needed.

In the present Examples, the total number of microbial colonies was further determined by the microorganism detection method (GB 4789.2) for the products in 10 duplicate productions, and 5 points of each test sample were determined for microorganism, thereby obtaining 50 microbial data in total. The batch proportion of each interval was statistically analyzed according to the results. The detailed results are as shown in Table 2.

The test method for grease exudation: a modified Schreiber experimental method was used to determining the melting property of the processed cheese, where a processed cheese sample having a diameter of 15 mm and a thickness of 10 mm was taken with a puncher in the fiber direction of the processed cheese, the sample was placed in a petri dish having a diameter of 9 cm and a height of 1.5 cm pre-lined with a filter paper to recover the temperature at room temperature for 30 min, then the sample was placed in an oven preheated to 100°C to be heated for 1 h, and then the sample removed from the oven for determining the diameter of an oil circle formed from the grease after the processed cheese was melted.

The test method for drawing property: the processed cheese was cut into processed cheese filaments having a section of 3 mm × 3 mm and a length of 15 mm, which were then placed at room temperature for 15-20 min. 100 g of the processed cheese filaments were weighed and uniformly dispersed on a pizza having a diameter of 9 inches to be used later. The sample was placed in an electrical oven preheated to 230°C and baked for 8 min, and then removed from the electrical oven and timed for 2 minutes to measure. The processed cheese was lifted with a fork and stretched upwards until the processed cheese filaments were broken. The stretched length of the processed cheese was measured, and each of the data was 3 times, rounded to 0.1cm. The average of the data was calculated and used as the drawing property data of the processed cheese.

Table 2

	Example 1	Example 2	Example 3
proportion of batches having a total number of colonies ≤ 50	100%	100%	100%
proportion of batches having a total number of 50-100	/	/	/
proportion of batches having a total number of colonies > 100	/	/	/
grease exudation, mm	37	42	46
drawing property, cm	30	25	28

Comparative Examples 1-10

The present Comparative Examples 1-10 each provide a processed cheese and a preparation method therefor.

A part of the formulations is shown in Table 3, where % represents a mass percentage, and the balance of the formulation is water. The preparation methods were the same as those in the Examples. In each comparative example, the amount of the edible salt added was 0.8%, the amount of citric acid added was 0.4%, the amount of the skim milk powder added was 0.5%, the amount of the preservative (sorbic acid) added was 0.05%, the amount of the edible essence added was 0.1%, and the amount of the colorant (β -carotene) added was 0.02%.

Here, the cheese used in Comparative Example 4 was a low fat frozen cheddar cheese (which was ripened for 0 month), and had a fat content of 10%. The remaining materials were the same as those in Example 3 unless specifically indicated otherwise.

Table 3

Raw materials	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
cheese	15%	15%	15%	15%	15%
enzymatic casein	17.81%	17.81%	17.81%	17.81%	17.81%
high melting point fat	33°C palm oil 0.9%	33°C palm oil 5.2%	33°C palm oil 7.2%	33°C palm oil 0.8%	33°C palm oil 2.5%
low melting point fat	24°C palm oil 12.6%	24°C palm oil 22.7%	24°C palm oil 11.7%	24°C palm oil 21.1%	24°C palm oil 16.4%
proportion of fat in low melting point fat to total fat	70%	70%	50%	90%	70%
protein-fat ratio	1	1.8	1.3	1.3	1.3
disodium hydrogen phosphate	0.6%	0.6%	0.6%	0.6%	1.0%
sodium hexametaphosphate	0.2%	0.2%	0.2%	0.2%	0.2%
sodium citrate	0.4%	0.4%	0.4%	0.4%	0.4%
Raw materials	Comparative Example 6	Comparative Example 7	Comparative Example 8	Comparative Example 9	Comparative Example 10
cheese	15%	15%	15%	15%	15%
enzymatic casein	17.81%	17.81%	17.81%	17.81%	17.81%
high melting point fat	33°C palm oil 2.5%	33°C palm oil 2.5%	33°C palm oil 2.5%	33°C palm oil 2.5%	33°C palm oil 2.5%
low melting point fat	24°C palm oil 16.4%	24°C palm oil 16.4%	24°C palm oil 16.4%	24°C palm oil 16.4%	24°C palm oil 16.4%

proportion of fat in low melting point fat to total fat	70%	70%	70%	70%	70%
protein-fat ratio	1.3	1.3	1.3	1.3	1.3
disodium hydrogen phosphate	0.3%	0.6%	0.6%	0.6%	0.6%
sodium hexametaphosphate	0.2%	0.5%	0%	0.2%	0.2%
sodium citrate	0.4%	0.4%	0.4%	0.8%	0.1%

In the present Comparative Examples, the products were further detected by the methods as described for the above Examples, and the detection results are as shown in Table 4.

Table 4

	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5
proportion of batches having a total number of colonies $\leq$ 50	62%	/	32%	100%	74%
proportion of batches having a total number of 50-100	26%	/	52%	/	22%
proportion of batches having a total number of colonies $>$ 100	12%	/	16%	/	4%
grease exudation, mm	31	/	35	52	31
drawing property, cm	35	/	32	20	30
	Comparative Example 6	Comparative Example 7	Comparative Example 8	Comparative Example 9	Comparative Example 10
proportion of batches having a total number of colonies $\leq$ 50	100%	100%	/	80%	/
proportion of batches having a total number of 50-100	/	/	/	20%	/
proportion of batches having a total number of colonies $>$ 100	/	/	/	/	/
grease exudation, mm	54	24	/	42	/
drawing property, cm	25	29	/	31	/

From the above Comparative Examples, the inventors have investigated and found the following results.

Comparative Example 1: the product had a larger protein-fat ratio and a low fat content, and was shaped rapidly, resulting in a low sterilization effect.

Comparative Example 2: the product had a smaller protein-fat ratio and insufficient protein, and failed to shape (where the product remained in a liquid state after the whole process was completed, the emulsifying medium was insufficient, the emulsification was insufficient, and the protein was suspended in the liquid). The comparison in product status between Comparative Example 2 and Example 1 is as shown in Fig. 1, where the left picture is the picture of the product of Example 1 which could be normally shaped and kneaded into a dough, had lines, had a poor flowability, and had a long drawing property when being stretched; and the right picture is the picture of the product of the present Comparative Example which failed to shape, and was in a liquid state rather than a dough form after being heated and emulsified.

Comparative Example 3: the product had a too high content of the high melting point fat, and was shaped rapidly, resulting in a poor sterilization effect.

Comparative Example 4: the product had a too high content of low melting point fat, and was shaped slowly, was not chewy enough after kneading (where the product had been formed into a dough, but still had some flowability, had lines when stirring and returned back to a planar surface without lines after stirring was stopped, was not easy to stretch, and was prone to breaking), had a poor baking performance, and was not kneaded sufficiently and fully shaped after the process was completed, resulting in poor drawing property. The status of the product is as shown in Fig. 2.

Comparative Example 5: the product had a high overall phosphate content, and was shaped rapidly, resulting in a poor sterilization effect.

Comparative Example 6: the product had a low disodium hydrogen phosphate content, resulting in a poor buffering capacity, and a large amount of

grease was exuded after sterilization, so that the final product exude grease significantly when baking.

Comparative Example 7: the product had a high sodium hexametaphosphate content, and was not stably emulsified, so that no oil was exuded when baking at 230°C, and the surface was scorched.

Comparative Example 8: the product had a low sodium hexametaphosphate content, and was shaped in this process.

Comparative Example 9: the product had a high sodium citrate content, and was shaped rapidly into a dough during kneading, resulting in a short effective sterilization time.

Comparative Example 10: the product had a low sodium citrate content, and failed to shape after sterilization.

Comparative Example 11

The present Comparative Example provides a processed cheese and a preparation method therefor. The formulation and preparation method were the same as those in Example 3, except that in step 4, the mixture 3 was heated to 80°C (i.e., the sterilization temperature) over a period of 400 s, so that the materials were emulsified and shaped ahead of time, and had been formed into a chewy mixture 4 before reaching the sterilization temperature. Finally, the products in 10 duplicate productions (with 5 points of each test sample detected for microorganism) were detected by the same methods as described for the above Examples. In the results, the proportion of the batches having a total number of colonies ≤ 50 was 86%, the proportion of the batches having a total number of colonies of 50-100 was 12%, and the proportion of the batches having a total number of colonies exceeding 100 was 2%. The grease exudation was 38 mm, and the drawing property was 32 cm.

Comparative Example 12

The present Comparative Example provides a processed cheese and a preparation method therefor. The formulation and preparation method were the same as those in Example 3, except that in step 1, all kinds of the emulsifying salts (i.e., disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate) were added simultaneously, and the materials were shaped rapidly when stirring, resulting in a slow heat transfer at the sterilization temperature. Finally, the products in 10 duplicate productions (with 5 points of each test sample detected for microorganism) were detected by the same methods as described for the above Examples. In the results, the proportion of the batches having a total number of colonies ≤ 50 was 66%, the proportion of the batches having a total number of colonies of 50-100 was 28%, and the proportion of the batches having a total number of colonies exceeding 100 was 6%. The grease exudation was 35 mm, and the drawing property was 29 cm.

Although the present invention have been described in detail by way of general illustration and particular embodiments, some variations or modifications may be made based on the present invention, which is obvious for those skilled in the art. Thus, all these variations or modifications which are made without departing from the spirit of the present invention fall within the protection scope of the present invention.

What is claimed is:

1. A method for preparing a processed cheese, sequentially comprising steps of:

mixing remaining components in a raw material except for sodium citrate to obtain a premix, wherein the raw material comprises a cheese, an oil raw material, an enzymatic casein and an emulsifying salt, and the emulsifying salt comprises disodium hydrogen phosphate, sodium hexametaphosphate and sodium citrate;

sterilizing the premix; and

adding sodium citrate to the sterilized premix for full emulsification.

2. The method for preparing a processed cheese according to claim 1, wherein the sterilizing comprises heating the premix to 75-80°C in 100-150 seconds.

3. The method for preparing a processed cheese according to claim 1 or 2, wherein a mass ratio of the disodium hydrogen phosphate, the sodium hexametaphosphate and the sodium citrate is (5-8):(1-2):(3-4).

4. The method for preparing a processed cheese according to any one of claims 1-3, wherein:

a mass ratio of a sum of protein in the cheese and protein in the enzymatic casein to a sum of fat in the cheese and fat in the oil raw material is 1:(1.2-1.5); and/or

the oil raw material comprises a low melting point fat and optionally a high melting point fat, and a mass of fat in the low melting point fat accounts for 60%-80% by mass of a total fat, wherein the total fat refers to a sum of fat in the cheese and fat in the oil raw material, the high melting point fat has a melting point in a range from 32°C to 42°C, and the low melting point fat has a

melting point in a range from 0°C to 30°C.

5. The method for preparing a processed cheese according to claim 4, wherein:

the cheese has a ripening period in a range from 0 to 1 month; and/or

the high melting point fat is one or more selected from a group consisting of 33°C palm oil, butter, anhydrous milk fat and shortening; and/or

the low melting point fat is 24°C palm oil and/or coconut oil.

6. The method for preparing a processed cheese according to any one of claims 1-5, comprising steps of:

(1) mixing the enzymatic casein, the disodium hydrogen phosphate, the sodium hexametaphosphate and water to obtain a mixture 1;

(2) mixing the oil raw material with the mixture 1 to obtain a mixture 2;

(3) mixing remaining materials in the raw material except for sodium citrate with the mixture 2 to obtain the premix;

(4) sterilizing the premix; and

(5) mixing the premix with the sodium citrate.

7. The method for preparing a processed cheese according to claim 6, wherein

in step (1), water, the enzymatic casein, the disodium hydrogen phosphate and the sodium hexametaphosphate are mixed while stirring at a stirring speed of 60-80 rpm and a water temperature of 35-40°C, wherein water is added into the mixture system at a rate of 8-10% of total amount of formulation per minute, and the stirring is stopped after addition of water; and/or

in step (2), the oil raw material is heated to 40 - 45°C, and then mixed with the mixture 1 with stirring at a rotation speed of 60-80 rpm for 2-3 min to obtain the mixture 2; and/or

in step (3), the remaining materials in the raw material except for sodium citrate are mixed with the mixture 2 with stirring at 80-100 rpm for 4-5 min to

obtain the premix; and/or

in step (5), the sodium citrate is dissolved by water at 90°C or above, and then mixed with the sterilized premix at 75-80°C at a rotation speed of 40-60 rpm for 3-5 min; and/or

after step (5), the method further comprises a step of cooling to 0°C or below in 20 min - 40 min.

8. The method for preparing a processed cheese according to any one of claims 1-7, wherein the raw material further comprises one or more selected from a group consisting of a salt, citric acid, a skim milk powder, a preservative, an edible essence, and a colorant.

9. The method for preparing a processed cheese according to any one of claims 1-8, wherein the raw material comprises: 15-20 parts by weight of the cheese, 15-22 parts by weight of the oil raw material, 16-18 parts by weight of the enzymatic casein, 0.5-0.8 parts by weight of the disodium hydrogen phosphate, 0.1-0.2 parts by weight of the sodium hexametaphosphate and 0.3-0.4 parts by weight of the sodium citrate, and optionally comprises 0.5-0.8 parts by weight of the salt, 0.3-0.5 parts by weight of the citric acid, 0.5-1.0 parts by weight of the skim milk powder, 0.05-0.1 parts by weight of the preservative, 0.05-0.2 parts by weight of the edible essence, and 0.01-0.05 parts by weight of the colorant.

10. A processed cheese obtained by the method for preparing a processed cheese according to any one of claims 1-9.