

DESCRIPTION

Title of Invention

COMPOSITION AND METHOD OF PRODUCING SAME

Technical Field

[0001] The present invention relates to a composition and a method of producing the same.

Background Art

[0002] Gum bases, which are base materials of chewing gums, are generally composed of synthetic polymers, natural resins and the like, but in addition to these, can be obtained by, for example, reacting a gelatin with polyphenols. For example, Patent Document 1 discloses the production of a rubber-like composition such as a gum base by using a gelatin, a polyphenol, and a flocculating agent (multivalent salts or phenol oxidase).

[0003] Incidentally, with regard to foods containing gelatin, a technique is known in which the texture is changed by crosslinking a gelatin with transglutaminase. For example, gummies (Patent Documents 2 to 4), artificial shark fin (Patent Document 5), and shredded kelp (Patent Document 6), etc., each containing a gelatin treated with transglutaminase, have been disclosed.

Citation List

Patent Documents

[0004] Patent Document 1: Patent Publication JP-A-2007-89579

Patent Document 2: Patent Publication JP-A-2011-130714

Patent Document 3: Patent Publication JP-A-2018-23318

Patent Document 4: Patent Publication JP-A-2020-59653

Patent Document 5: Patent Publication JP-A-H06-98743

Patent Document 6: Patent Publication JP-A-H09-107923

Summary of Invention

Technical Problem

[0005] The reaction product between a gelatin and a polyphenol, as disclosed in Patent Document 1, has room for improvement in terms of elasticity. Accordingly, an object of the present invention is to provide a composition exhibiting improved elasticity.

Solution to Problem

[0006] As a result of intensive studies, the present inventors et al. have found out that a composition exhibiting improved elasticity is obtained by reacting a crosslinked gelatin, which is crosslinked with a protein-crosslinking enzyme, with a polyphenol, and thus completed the present invention.

[0007] The present invention includes the following embodiments.

[1]

A method of producing a composition, the method including:

a step of reacting a gelatin with a protein-crosslinking enzyme to obtain a crosslinked gelatin having a shear viscosity higher than a shear viscosity of the gelatin; and

a step of reacting the crosslinked gelatin with a polyphenol.

[2]

The production method according to [1], in which the shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the gelatin by 0.7 mPa·s or more.

[3]

The production method according to [1] or [2], in which the shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the gelatin by 15% or more.

[4]

The production method according to any one of [1] to [3], in which the shear viscosity of the crosslinked gelatin is 4.4 mPa·s or more.

[5]

The production method according to any one of [1] to [4], in which an amount of the polyphenol is 30% to 70% by mass, based on a mass of the crosslinked gelatin.

[6]

The production method according to any one of [1] to [5], in which the protein-crosslinking enzyme is a transglutaminase.

[7]

The production method according to any one of [1] to [6], in which the composition is a food composition.

[8]

The production method according to [7], in which the food composition is a confectionery composition.

[9]

The production method according to [7], in which the food composition is a chewing composition.

[10]

A composition containing:

a reaction product between a crosslinked gelatin and a polyphenol; and

a decomposition product of a protein-crosslinking enzyme.

[11]

The composition according to [10], in which an amount of the polyphenol is 30% to 70% by mass, based on a mass of the crosslinked gelatin.

[12]

The composition according to [10] or [11], in which the protein-crosslinking enzyme is a transglutaminase.

[13]

The composition according to any one of [10] to [12], in which the composition is a food composition.

[14]

The composition according to [13], in which the food composition is a confectionery composition.

[15]

The composition according to [13], in which the food composition is a chewing composition.

Advantageous Effects of Invention

[0008] According to the present invention, it is possible to provide a composition exhibiting improved elasticity.

Description of Embodiments

[0009] Hereinafter, embodiments of the present invention will be specifically described, but the present invention is not limited to these, and various modifications can be made without departing from the gist of the present invention.

[0010] <Method of Producing Composition>

An embodiment of the present invention relates to a method of producing a composition, which includes a step (hereinafter referred to as "crosslinking step") of reacting a gelatin (hereinafter referred to as "raw gelatin") with a protein-crosslinking enzyme to obtain a crosslinked gelatin having a shear viscosity higher than a shear viscosity of the gelatin and a step (hereinafter referred to as "reaction step") of reacting the crosslinked gelatin with a polyphenol.

[0011] According to the production method of the present embodiment, the elasticity can be improved (increased) by crosslinking a raw gelatin with a protein-crosslinking enzyme prior to the reaction with a polyphenol. According to the production method of the present embodiment, it is also possible to improve (decrease) stickiness in addition to the improvement of elasticity. Furthermore, according to the production method of the present embodiment, since the elasticity and stickiness can be improved by crosslinking a raw gelatin with a protein-crosslinking enzyme, the amount of polyphenols, which contribute to these physical properties, can be reduced. As a result, the astringency taste caused by polyphenols can be suppressed.

[0012] (Crosslinking Step)

The crosslinking step is a step of reacting a raw gelatin with a protein-crosslinking enzyme to obtain a crosslinked gelatin having a shear viscosity higher than the shear viscosity of the raw gelatin.

[0013] The kind of raw gelatin is not particularly limited, but is preferably one that is acceptable as a food. As used herein, "acceptable as a food" means that unacceptable actions are not caused by the ingestion into the body. Examples of the raw gelatin include those derived from pig skin, pig bones, cow skin, cow bones, fish skin, and fish scales. Gelatin derived from these may be subjected to, for example, acid treatment, alkali treatment, or enzyme treatment. One kind of the raw gelatin may be used singly or two or more kinds thereof may be used in combination.

[0014] Although not particularly limited, the shear viscosity of the raw gelatin is preferably 2.0 to 6.0 mPa·s, more preferably 2.5 to 5.5 mPa·s, still more preferably 3.0 to 5.0 mPa·s, particularly preferably 3.0 to 4.0 mPa·s. By setting the shear viscosity of the raw gelatin to the above range, it is easy to adjust the elasticity of the composition to be finally obtained to a proper range.

The shear viscosity can be measured using a viscoelasticity measuring instrument. Details of the measurement conditions are as described in Examples below.

[0015] The kind of protein-crosslinking enzyme is not particularly limited, but is preferably one that is acceptable as a food. Specific examples of the protein-crosslinking enzymes include transglutaminase. The kind of transglutaminase is not particularly limited, and those derived from various organisms can be used.

[0016] The amount of the protein-crosslinking enzyme is not particularly limited, but is preferably 0.1% to 10.0% by mass, more preferably 0.5% to 7.5% by mass, still more preferably 1.0% to 5.5% by mass based on the mass of the raw gelatin. By setting the amount of the protein crosslinking enzyme to 0.1% by mass or more, the crosslinking rate can be improved. By setting the amount of the protein crosslinking enzyme to 10.0% by mass or less, the amount of the protein-crosslinking enzyme used can be reduced and the cost can be reduced.

[0017] The reaction of the raw gelatin with the protein-crosslinking enzyme may be conducted until the shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the raw gelatin. The shear viscosity of crosslinked gelatin increases in proportion to the time of reaction between the raw gelatin and the protein-crosslinking enzyme.

[0018] The reaction of the raw gelatin with the protein-crosslinking enzyme is preferably conducted at the optimum temperature for the protein-crosslinking enzyme. In a case where the protein-crosslinking enzyme is transglutaminase, the reaction temperature is preferably 40°C to 60°C, more preferably 45°C to 55°C.

[0019] The shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the raw gelatin by preferably 0.2 mPa·s or more, more preferably 0.7 mPa·s or more, still more preferably 1.0 mPa·s or more, particularly preferably 1.3 mPa·s or more. In particular, by setting the shear viscosity of the crosslinked gelatin to be higher than the shear viscosity of the raw gelatin by 0.7 mPa·s or more, the elasticity and stickiness can be significantly improved. Examples of the upper limit of the increase in shear viscosity (that is, (shear viscosity of crosslinked gelatin) - (shear viscosity of raw gelatin)) include 6.0 mPa·s, 5.0 mPa·s, 4.0 mPa·s, and 3.5 mPa·s. The lower and upper limits may be appropriately set in combination to

demarcate the numerical range. For example, the increase in shear viscosity may be set to 0.2 to 6.0 mPa·s, 0.7 to 5.0 mPa·s, 1.0 to 4.0 mPa·s, or 1.3 to 3.5 mPa·s.

[0020] The shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the raw gelatin by preferably 5% or more, more preferably 15% or more, still more preferably 30% or more, particularly preferably 40% or more. In particular, by setting the shear viscosity of the crosslinked gelatin to be higher than the shear viscosity of the raw gelatin by 15% or more, the elasticity and stickiness can be significantly improved. Examples of the upper limit of the increase in shear viscosity (that is, $((\text{shear viscosity of crosslinked gelatin}) - (\text{shear viscosity of raw gelatin})) / (\text{shear viscosity of raw gelatin}) \times 100$) include 90%, 80%, 70%, and 67%. The lower and upper limits may be appropriately set in combination to demarcate the numerical range. For example, the increase in shear viscosity may be set to 5% to 90%, 15% to 80%, 30% to 70%, or 40% to 67%.

[0021] The preferred shear viscosity of the crosslinked gelatin varies depending on the shear viscosity of the raw gelatin, but may be set to, for example, 4.4 mPa·s or more, 4.4 to 5.5 mPa·s, 4.4 to 9.0 mPa·s, 4.4 to 7.0 mPa·s, or 4.4 to 6.0 mPa·s.

[0022] When the shear viscosity of the crosslinked gelatin reaches a predetermined value, it is preferable to inactivate the protein-crosslinking enzyme. By inactivating the protein-crosslinking enzyme, it is possible to prevent the crosslinking reaction from proceeding excessively. Examples of the inactivation method include a treatment at a temperature at which the protein-crosslinking enzyme is inactivated. In a case where the protein-crosslinking enzyme is transglutaminase, the protein-crosslinking enzyme can be inactivated at, for example, 70°C to 90°C.

[0023] (Reaction Step)

The reaction step is a step of reacting the crosslinked gelatin obtained in the crosslinking step with a polyphenol. The reaction temperature is preferably 60°C or more, more preferably 80°C or more from the viewpoint of improving the fluidity of the crosslinked gelatin and easily mixing the crosslinked gelatin with a polyphenol. The upper limit of the reaction temperature may be set to, for example, 100°C.

[0024] The kind of polyphenol is not particularly limited, but is preferably one that is acceptable as a food. Examples of the polyphenol include those derived from green tea, gallnuts, grape seeds, lychees, pomegranates, chestnuts, apples, cacaos, and black tea, and quercetin. One kind of the polyphenol may be used singly or two or more kinds thereof may be used in combination.

[0025] The amount of the polyphenol is not particularly limited, but is preferably 20% to 100% by mass, more preferably 30% to 70% by mass, still more preferably 40% to 50% by mass based on the mass of the crosslinked gelatin. By setting the amount of the polyphenol to 20% by mass or more, the elasticity and stickiness can be further improved. By setting the amount of the polyphenol to 100% by mass or less, the astringency taste caused by the polyphenol can be suppressed.

[0026] In the reaction step, optional ingredients may be additionally used, if necessary. Examples of the optional ingredients include a multivalent salt, a plasticizer, and an emulsifier.

[0027] A multivalent salt can improve the elasticity of the composition. Examples of the multivalent salt include calcium lactate, magnesium sulfate, ammonium phosphate, potassium aluminum sulfate, and ferric citrate.

[0028] The amount of the multivalent salt is not particularly limited, but is preferably 0.1% to 12% by mass, more preferably 1% to 8% by mass, still more preferably 2% to 4% by mass based on the mass of the crosslinked gelatin.

[0029] The plasticizer can adjust the flexibility of the composition. Examples of the plasticizer include polyhydric alcohols (for example, glycerin, polyglycerin, polyethylene glycol, and polypropylene glycol); vegetable oils; and sugar alcohols (for example, sorbitol, mannitol, xylitol, and erythritol).

[0030] The amount of the plasticizer is not particularly limited, but is preferably 10% to 250% by mass, more preferably 50% to 200% by mass, still more preferably 100% to 150% by mass based on the mass of the crosslinked gelatin.

[0031] Examples of the emulsifier include glycerin fatty acid esters and sucrose fatty acid esters.

[0032] The amount of the emulsifier is not particularly limited, but is preferably 2% to 3% by mass based on the mass of the crosslinked gelatin.

[0033] In the reaction step, a composition is obtained. Examples of the composition include a food composition. As used herein, a "food composition" refers to a composition that is acceptable as a food. The food composition may be an item finished as a food (hereinafter referred to as a "food product") or may be an ingredient of a food product.

Examples of the food product include a confectionery composition and a chewing composition. As used herein, a "chewing composition" refers to a composition that exhibits elasticity, can be thus continuously chewed for a certain period of time in the mouth, and has an enjoyable flavor. Examples of the confectionery and/or chewing compositions include gums, soft candies, and gummies.

Examples of the ingredient of a food product include a gum base.

[0034] (Flavoring Step)

In a case where the composition is a food composition (particularly a food product), the production method of the present embodiment may further include a flavoring step. The flavoring step is, for example, a step of further mixing a sweetener, an acidulant, and a flavoring agent.

[0035] Examples of the sweetener include glucose, fructose, arabinose, Palatinose, trehalose, maltose, lactose, xylitol, maltitol, sorbitol, erythritol, lactitol, mannitol, reduced Palatinose, reduced starch syrup, aspartame, acesulfame potassium, sucralose, neotame, alitame, and stevia.

[0036] Examples of the acidulant include citric acid, malic acid, fumaric acid, ascorbic acid, acetic acid, and tartaric acid.

[0037] Examples of the flavoring agent include orange oil, lemon oil, grapefruit oil, lime oil, tangerine oil, mandarin, peppermint oil, and spearmint oil.

[0038] <Composition>

An embodiment of the present invention relates to a composition containing a reaction product between a crosslinked gelatin and a polyphenol and a decomposition product of a protein-crosslinking enzyme. The composition of the present embodiment may further contain optional ingredients. The composition of the present embodiment can be produced by the above-described production method.

[0039] Details of the crosslinked gelatin, polyphenol, protein-crosslinking enzyme, optional ingredients, and composition in the present embodiment are as described in the section of <Method of Producing Composition> above. The decomposition

product of a protein-crosslinking enzyme is a substance that is derived from a protein-crosslinking enzyme and has lost its enzymatic activity.

[0040] The composition of the present embodiment exhibits improved elasticity since crosslinked gelatin crosslinked with a protein-crosslinking enzyme is used as a raw material. The composition of the present embodiment also exhibits improved stickiness.

Examples

[0041] Hereinafter, the present invention will be described in more detail using Examples and Comparative Examples, but the technical scope of the present invention is not limited to these.

[0042] <Production of Gum>

Gums were prepared using the ingredients presented in Tables 1 to 5 below. Details of the ingredients are as follows.

- Gelatin (APH200)

Product name: Gelatin APH-200, manufacturer: Nitta Gelatin Inc., jelly strength: 185 to 215 g, origin: pig skin, extraction: acid treatment

- Gelatin (APH150)

Product name: Gelatin APH-150, manufacturer: Nitta Gelatin Inc., jelly strength: 135 to 165 g, origin: pig skin, extraction: acid treatment

- Gelatin (APH250)

Product name: Gelatin APH-250, manufacturer: Nitta Gelatin Inc., jelly strength: 235 to 265 g, origin: pig skin, extraction: acid treatment

- Gelatin (#200)

Product name: Gelatin #200, manufacturer: Nitta Gelatin Inc., jelly strength: 185 to 215 g, origin: cow bones, extraction: alkali treatment

- Catechin

Product name: Pharma Foods Delicious Catechin PF-TP80, manufacturer: Pharma Foods International Co., Ltd.

- Glycerin

Product name: Food Additive Glycerin, manufacturer: Kao Corporation

- Transglutaminase

Product name: "ACTIVA" (registered trademark) TG-K, manufacturer: AJINOMOTO CO., INC.

[0043] (1. Production of Gum Base)

[Step 1]

Using 1.5 times the amount of water to gelatin, the gelatin was allowed to swell for 15 to 30 minutes.

[Step 2]

Gelatin swollen with water was dissolved in a warm bath at 50°C, and a predetermined amount of transglutaminase was added, and the mixture was stirred and then kept warm to conduct the reaction for a predetermined time.

[Step 3]

After the reaction was terminated, the reaction product was treated at 80°C for 1 minute or more to inactivate the transglutaminase.

[0044]

[Step 4]

Catechin, glycerin and calcium lactate were further added to the reaction product undergone step 3, and mixing was performed for 5 to 10 minutes.

[Step 5]

The mixture obtained in step 4 was transferred to another container and dried to obtain a gum base.

[0045] (2. Production of Gum)

[Step 1]

The gum base obtained above was placed in a heated kneader and mixed for several minutes.

[Step 2]

Sugar alcohol and a flavoring agent were added to the softened gum base in this order, and mixing was performed for several minutes.

[Step 3]

The mixture obtained in step 2 was molded to obtain a gum.

[0046] <Evaluation Method>

(Shear Viscosity)

After step 3 in "(1. Production of gum base)" above, water at 60°C was added so that the final gelatin concentration became 6.67%, the mixture was stirred until to be homogenous, thereby preparing a sample for shear viscosity measurement.

The shear viscosity of the sample was measured using a viscoelasticity measuring instrument (MCR-102, manufactured by Anton Paar GmbH) and a coaxial double cylinder system (27 mm ϕ). Specifically, the viscosity of the 6.67% gelatin solution 2 minutes after the start of measurement at a shear rate of 100 s⁻¹ and a measurement temperature of 60°C was taken as the shear viscosity. The results are presented in Tables 1 to 5.

The amount of change in shear viscosity and rate of change in shear viscosity presented in Tables 1 to 5 are the amount of change and rate of change based on the shear viscosity in a case where the reaction time with transglutaminase is 0 minutes.

[0047] (Sensory Evaluation)

The gum base obtained in step 5 in "(1. Production of gum base)" above was used as a sample for sensory evaluation.

[0048] [Chewiness (elasticity)]

Three evaluators evaluated the chewiness (elasticity) after chewing 1.0 g of the gum base for 1 minute. Elasticity is evaluated on a 10-rating scale, with rating 1 indicating weak elasticity and rating 10 indicating strong elasticity. In order to standardize the evaluation scale, the elasticity of Comparative Example 4 was evaluated as rating 1 and the elasticity of Example 5-2 was evaluated as rating 10.

The elasticity in a case where the reaction time with transglutaminase was 0 minutes was taken as the standard, and if the elasticity exceeded this, it was judged that the elasticity was improved. A rating of 7 or more is preferable. The results are presented in Tables 1 to 5.

[0049] [Attachment to Teeth (stickiness)]

Three evaluators evaluated the attachment to teeth (stickiness) after chewing 1.0 g of the gum base for 1 minute. The stickiness was evaluated on a 10-rating scale, with rating 1 indicating weak stickiness and rating 10 indicating strong stickiness. In order to standardize the evaluation scale, the stickiness of Comparative Example 4 was evaluated as rating 10 and the stickiness of Example 5-2 was evaluated as rating 1.

The stickiness in a case where the reaction time with transglutaminase was 0 minutes was taken as the standard, and if the stickiness was lower than this, it was judged that the stickiness was improved. A rating of 4 or less is preferable. The results are presented in Tables 1 to 5.

[0050] [Table 1]

Table 1

	Comparative Example 1	Example 1-1	Example 1-2	Example 1-3	Comparative Example 2	Example 2-1	Example 2-2	Example 2-3	Comparative Example 3	Example 3-1	Example 3-2	Example 3-3
Gelatin (APH200) (g)	30	30	30	30	30	30	30	30	30	30	30	30
Calcium lactate (g)	1.7	1.7	1.7	1.7	1.4	1.4	1.4	1.4	0.8	0.8	0.8	0.8
Catechin (g)	15	15	15	15	15	15	15	15	15	15	15	15
Glycerin (g)	40	40	40	40	40	40	40	40	40	40	40	40
Water (g)	45	45	45	45	45	45	45	45	45	45	45	45
Transglutaminase (g)	0.4	0.4	0.4	0.4	0.8	0.8	0.8	0.8	1.6	1.6	1.6	1.6
Transglutaminase (% by mass)	0.3	0.3	0.3	0.3	0.6	0.6	0.6	0.6	1.2	1.2	1.2	1.2
Reaction time	0min	7.5min	20min	25min	0min	5.0min	10min	12.5min	0min	2.5min	5.0min	7.5min
Shear viscosity [mPa·s]	3.5	3.7	4.5	4.8	3.5	3.7	4.4	4.7	3.5	4.1	4.6	5.0
Amount of change in Shear viscosity [mPa·s]	-	0.2	1	1.3	-	0.2	0.9	1.2	-	0.6	1.1	1.5
Rate of change in shear viscosity [%]	-	5.7	28.6	37.1	-	5.7	25.7	34.3	-	17.1	31.4	42.9
(Sensory evaluation)												
Chewiness (elasticity)	2	3	7	7	2	3	7	9	2	5	7	7
Attachment to teeth (stickiness)	7	7	3	4	7	6	3	2	7	5	2	3

[0051] [Table 2]

Table 2

	Comparative Example 4	Example 4-1	Example 4-2	Example 4-3	Example 4-4	Example 4-5
Gelatin (APH150) (g)	30	30	30	30	30	30
Calcium lactate (g)	0.8	0.8	0.8	0.8	0.8	0.8
Catechin (g)	15	15	15	15	15	15
Glycerin (g)	40	40	40	40	40	40
Water (g)	45	45	45	45	45	45
Transglutaminase (g)	1.6	1.6	1.6	1.6	1.6	1.6
Transglutaminase (% by mass)	1.2	1.2	1.2	1.2	1.2	1.2
Reaction time	0min	5.0min	7.5min	10min	12.5min	15min
Shear viscosity [mPa·s]	3.0	3.5	3.8	4.2	4.5	5.0
Amount of change in Shear viscosity [mPa·s]	-	0.5	0.8	1.2	1.5	2
Rate of change in shear viscosity [%]	-	16.7	26.7	40.0	50.0	66.7
(Sensory evaluation)						
Chewiness (elasticity)	1	2	2	6	7	8
Attachment to teeth (stickiness)	10	9	8	3	3	2

[0052] [Table 3]

Table 3

	Comparative Example 5	Example 5-1	Example 5-2
Gelatin (APH250) (g)	30	30	30
Calcium lactate (g)	0.8	0.8	0.8
Catechin (g)	15	15	15
Glycerin (g)	40	40	40
Water (g)	45	45	45
Transglutaminase (g)	1.6	1.6	1.6
Transglutaminase (% by mass)	1.2	1.2	1.2
Reaction time	0min	2.5min	5.0min
Shear viscosity [mPa·s]	4.4	5.1	5.8
Amount of change in Shear viscosity [mPa·s]	-	0.7	1.4
Rate of change in shear viscosity [%]	-	15.9	31.8
(Sensory evaluation)			
Chewiness (elasticity)	6	7	10
Attachment to teeth (stickiness)	4	2	1

[0053]

[Table 4]

Table 4

	Comparative Example 6	Example 6-1	Example 6-2
Gelatin (#200) (g)	30	30	30
Calcium lactate (g)	0.8	0.8	0.8
Catechin (g)	15	15	15
Glycerin (g)	40	40	40
Water (g)	45	45	45
Transglutaminase (g)	1.6	1.6	1.6

Transglutaminase (% by mass)	1.2	1.2	1.2
Reaction time	0min	2.5min	5.0min
Shear viscosity [mPa·s]	5.0	6.1	8.1
Amount of change in Shear viscosity [mPa·s]	-	1.1	3.1
Rate of change in shear viscosity [%]	-	22.0	62.0
(Sensory evaluation)			
Chewiness (elasticity)	4	7	8
Attachment to teeth (stickiness)	6	2	2

[0054]

[Table 5]

Table 5

	Comparative Example 7	Example 7-1	Example 7-2
Gelatin (APH200) (g)	15	15	15
Gelatin (#200) (g)	15	15	15
Calcium lactate (g)	0.8	0.8	0.8
Catechin (g)	15	15	15
Glycerin (g)	40	40	40
Water (g)	45	45	45
Transglutaminase (g)	1.6	1.6	1.6
Transglutaminase (% by mass)	1.2	1.2	1.2
Reaction time	0min	2.5min	5.0min
Shear viscosity [mPa·s]	4.2	5.2	6.5
Amount of change in Shear viscosity [mPa·s]	-	1	2.3
Rate of change in shear viscosity [%]	-	23.8	54.8
(Sensory evaluation)			
Chewiness (elasticity)	5	8	8
Attachment to teeth (stickiness)	6	3	2

Claims

[Claim 1]

A method of producing a composition, the method comprising:
a step of reacting a gelatin with a protein-crosslinking enzyme to obtain a crosslinked gelatin having a shear viscosity higher than a shear viscosity of the gelatin; and
a step of reacting the crosslinked gelatin with a polyphenol.

[Claim 2]

The production method according to claim 1, wherein the shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the gelatin by 0.7 mPa·s or more.

[Claim 3]

The production method according to claim 1 or 2, wherein the shear viscosity of the crosslinked gelatin is higher than the shear viscosity of the gelatin by 15% or more.

[Claim 4]

The production method according to any one of claims 1 to 3, wherein the shear viscosity of the crosslinked gelatin is 4.4 mPa·s or more.

[Claim 5]

The production method according to any one of claims 1 to 4, wherein an amount of the polyphenol is 30% to 70% by mass, based on a mass of the crosslinked gelatin.

[Claim 6]

The production method according to any one of claims 1 to 5, wherein the protein-crosslinking enzyme is a transglutaminase.

[Claim 7]

The production method according to any one of claims 1 to 6, wherein the composition is a food composition.

[Claim 8]

The production method according to claim 7, wherein the food composition is a confectionery composition.

[Claim 9]

The production method according to claim 7, wherein the food composition is a chewing composition.

[Claim 10]

A composition comprising:

a reaction product between a crosslinked gelatin and a polyphenol; and

a decomposition product of a protein-crosslinking enzyme.

[Claim 11]

The composition according to claim 10, wherein an amount of the polyphenol is 30% to 70% by mass, based on a mass of the crosslinked gelatin.

[Claim 12]

The composition according to claim 10 or 11, wherein the protein-crosslinking enzyme is a transglutaminase.

[Claim 13]

The composition according to any one of claims 10 to 12, wherein the composition is a food composition.

[Claim 14]

The composition according to claim 13, wherein the food composition is a confectionery composition.

[Claim 15]

The composition according to claim 13, wherein the food composition is a chewing composition.