

1119,986



PATENT SPECIFICATION

DRAWINGS ATTACHED

1119,986

Date of Application and filing Complete Specification; 17 Sept., 1965.

No. 39825/65.

Application made in Japan (No. 18216) on 29 March, 1965.

(Patent of Addition to No. 1,067,854 dated 15 July, 1964.)

Complete Specification Published: 17 July, 1968.

© Crown Copyright 1968.

Index at acceptance:—A2 B6G

Int. Cl.:—A 23 11/26

COMPLETE SPECIFICATION

A method for the production of a Flavour Enhancer

We, TAKEDA CHEMICAL INDUSTRIES LIMITED, of 27 Doshomachi 2-chome, Higashi-ku, Osaka, Japan, a body corporate organised under the laws of Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a process for the production of a homogenous crystalline material and is an improvement in or modification of the invention claimed in our copending application No. 29108/64 (Serial No. 15 1,067,854).

Application No. 29108/64 claims a process for the preparation of a homogenous crystalline material comprising an alkali metal or ammonium salt of glutamic acid and an alkali metal or ammonium salt of a 5'-nucleotide, which comprises preparing an aqueous solution of an alkali metal or ammonium salt of glutamic acid and an alkali metal or ammonium salt of a 5'-nucleotide and crystallising the solution.

25 Abbreviations "GA", "GMP", "IMP", "GMP—Na₂", "IMP—Na₂", "5'-nucleotide" and "MSG" appearing throughout this specification and claims represent "glutamic acid", "5'-guanylic acid", "5'-inosinic acid", "disodium 5'-guanylate", "disodium 5'-inosinate", "either or both of IMP and GMP" and "monosodium glutamate", respectively.

35 It is known that, when 5'-nucleotide is employed together with GA, a superior flavour-enhancing effect is obtained due to the synergistic action between the GA and 5'-nucleotide (see, for example, Specification No. 898335). At the present time, condiment mixtures of MSG and the disodium salt of 5'-nucleotide are widely used.

These condiments are prepared by such processes as, for example:

(1). A hydrophilic organic solvent contain-

ing the disodium salt of the 5'-nucleotide is 45 sprayed onto the surface of MSG crystals, and the resulting coated MSG crystals are dried;

(2). MSG crystals are subjected to film-coating with the disodium salt of the 5'-nucleotide 50 in a fluidised bed; and

(3). A granular-type condiment is prepared from a kneaded mixture of MSG and the disodium salt of the 5'-nucleotide.

In these processes, MSG and the disodium salt of the 5'-nucleotide are not always homogeneously mixed and the resulting products are not of fine appearance and are liable to be disintegrated by a mechanical shock. Moreover, in the known processes, MSG and the disodium salt of the 5'-nucleotide starting materials are required to be purified prior to use, and in most cases the MSG has to be crystalline. It is therefore desirable to discover a method for producing fine and hard particles consisting of MSG and 5'-nucleotide in a desired ratio.

The present invention provides a process for the preparation of a homogeneous crystalline flavour-enhancing mass comprising monosodium glutamate and from 2 to 10% by weight (on an anhydrous basis) of the disodium salt of a flavourous 5'-nucleotide (based on the total weight of 5'-nucleotide and monosodium glutamate), which comprises preparing a hot aqueous solution of an alkali metal, ammonium or magnesium salt of a flavorous 5'-nucleotide and monosodium glutamate in an amount of from 20 to 62% by weight (of 5'-nucleotide and monosodium glutamate based on the solution), in which the ratio by weight of the alkali metal salt of the flavorous 5'-nucleotide to the monosodium glutamate is in the range of from 2:100 to 12:100, at a temperature above 40°C., adding gradually from 10 to 75% by volume of a freely water-miscible organic solvent to the hot aqueous solution (based on the total 85

12

volume of solvent and water present) while gently stirring without causing the local temperature of the hot solution to drop rapidly, gradually lowering the temperature of the aqueous mixture at a rate of 1 to 3 degrees centigrade per hour, and collecting the resulting crystalline mass from the aqueous mixture.

We have found that MSG and the disodium salt of a flavourous 5'-nucleotide (i.e. IMP—Na₂ and/or GMP—Na₂) can be incorporated together to form a homogeneous crystalline mass in spite of the dissimilarity in their molecular structure. The MSG and disodium salts of the 5'-nucleotides exist in a metastable supersaturated state even in a mixture of water and a hydrophilic organic solvent without rapid

precipitation. The metastable supersaturated state is maintained in a wider range than that in water itself and is as much stable as that in water.

It was also confirmed that the crystalline mass substantially consists homogeneously of the disodium salt of the 5'-nucleotide and MSG in an intended ratio, so that the resulting mass may contain from 2 to 10% by weight (on the anhydrous basis) of the disodium salt of the 5'-nucleotide.

The following table shows the approximate solubilities (in g/100 g. of solution) of MSG and the disodium salt of 5'-nucleotide in a ratio of 100:5 relatively to a mixed solvent of water and a hydrophilic organic solvent.

TABLE 1

Concentration of Methanol (% by volume)			
Temperature	25%	50%	75%
25° C.	29%	9%	1%
50° C.	35%	13%	2%
75° C.	43%	23% (70° C.)	3% (69° C.)

Throughout this specification, the concentration of hydrophilic organic solvent is represented as the ratio of the volume of the hydrophilic organic solvent relatively to the volume of hydrophilic organic solvent plus the volume of free water.

As is shown in Table 1, one would have expected that, when a hydrophilic organic solvent (e.g. methanol) is added to an aqueous solution of MSG and an alkali metal, ammonium or magnesium salt of a 5'-nucleotide having e.g., more than 60% by weight concentration, precipitation would occur rapidly at any temperature, whereby MSG and 5'-nucleotide would precipitate separately.

In this invention, 5'-nucleotide is incorporated as substantially its disodium salt to give the crystalline mass, even when other alkali metal, ammonium or magnesium salts of 5'-nucleotides are employed as a starting material, because MSG is employed in much larger amounts than the salt of the 5'-nucleotide.

The alkali metal, ammonium or magnesium salt of the 5'-nucleotide is a water-soluble salt of a 5'-nucleotide such as the sodium salt of IMP, the potassium salt of IMP, the ammonium salt of IMP, the magnesium salt of IMP, the sodium salt of GMP, the potassium salt of GMP or the ammonium salt of GMP or mixtures thereof.

5'-Nucleotides contaminated with flavourless pyrimidine type nucleotides (such as cytidylic acid, uridylic acid or thymidylic acid) may also be successfully employed in this invention. Even when a mixture of a pyrimidine type nucleotide and 5'-nucleotide is employed as the starting material, the crystalline mass of this invention is not substantially contaminated with the pyrimidine type nucleotide. Therefore, there may be employed, if necessary, a nucleic acid hydrolysate which contains a 5'-nucleotide and a pyrimidine type nucleotide in nearly the same amount. When the hydrolysate of nucleic acid is employed unchanged, the yield of the crystalline mass provided by this invention may occasionally be increased due to the effect of salting out with the occasional presence of an inorganic material, e.g. sodium chloride. Of course, the crystalline mass is not contaminated with the inorganic material.

In the process of this invention, the initial concentration of the hot aqueous solution should be adjusted to 64 to 20% by weight, and preferably 62 to 40% by weight, wherein the ratio by weight of alkali metal, ammonium or magnesium salt of 5'-nucleotide relatively to MSG is from 2:100 to 12:100. The initial temperature at which the addition of hydrophilic organic solvent is effected is over 40°C.

Generally, it may be preferable to add a hydrophilic organic solvent to the hot aqueous solution after the hot aqueous solution has been brought to the supersaturated condition. The supersaturated degree of the solution is increased by adding a hydrophilic organic solvent. The addition of hydrophilic organic solvent to the hot aqueous solution should be carried out dropwise with gentle stirring so as to avoid a partial rapid change of reaction conditions including temperature and the concentration of hydrophilic organic solvent.

Examples of hydrophilic organic solvents which may be used are methanol, ethanol, acetone, ethylene, glycol, dioxane, dimethylformamide and dimethylsulphoxide, and mixtures thereof. The optimum amount of hydrophilic organic solvent is in the range of 10 to 75% by volume, and especially 30 to 50% by volume.

Lowering of the temperature of such an aqueous mixture, whereby the metastable supersaturated state is broken, causes the crystalline mass to form and to grow. The lowering of the temperature of the aqueous mixture should be adjusted at a rate of 1 to 3°C. per hour. The lowering of the temperature of the aqueous mixture may be started during or after the addition of the hydro-

philic organic solvent, provided that the metastable supersaturated state is maintained and the temperature of the aqueous mixture is above 40°C., desirably above 60°C., when the addition of hydrophilic organic solvent is finished. For this purpose, the addition of a hydrophilic organic solvent may be carried out under pressure, if desired.

In the process of this invention, selection of the optimum gradient of temperature and continuous gentle stirring of the aqueous mixture consisting of MSG, alkali metal, ammonium or magnesium salt of 5'-nucleotide, water and hydrophilic organic solvent are very important factors for the growth of the crystalline mass.

The crystalline mass is prepared in a good yield. Table 2 shows the yield of the crystalline mass obtained by preparing a hot supersaturated aqueous solution of alkali metal, ammonium or magnesium salt of 5'-nucleotide and MSG (the concentration being 62% by weight, the ratio by weight of alkali salt of 5'-nucleotide relatively to MSG being 5:100 and the temperature being higher than 75°C.), by adding methanol dropwise to the hot aqueous solution with gentle stirring and by gradually lowering the temperature of the aqueous mixture.

TABLE 2

Concentration of Methanol (% by volume)			
Temperature	25%	50%	75%
25° C.	71.3%	89.0%	97.8%
50° C.	60.5%	82.5%	96.0%
75° C.	45.5%	73.1% (70° C.)	93.5% (69° C.)

Further, if desired, the aqueous mixture may be kept under pressure throughout the precipitation and/or the temperature may be lowered below room temperature, so as to increase the yield of the crystalline mass.

When the concentration of MSG and/or alkali metal, ammonium or magnesium salt of 5'-nucleotide in the aqueous hot solution is too low to obtain the product in a high yield, it may be possible to improve the yield by adding under pressure a hydrophilic organic solvent having a lower boiling point, e.g. methanol, at a temperature over 70°C.

The crystalline flavour-enhancing mass consisting substantially of the disodium salt of flavourous 5'-nucleotide and MSG, both in hydrated form, and containing from 2 to 10%

by weight on an anhydrous basis of the disodium salt of the flavourous 5'-nucleotide is produced in this way.

The product of the invention is illustrated in the accompanying drawings.

In these drawings, Figure 1 is a microscopic photograph of the novel crystalline mass of this invention.

As can be seen, the crystalline mass of this invention is rod-shaped, glassy, hard, dry and of very good appearance.

The homogeneity of the crystalline mass of this invention is demonstrated by the following results:

(1) When a piece of the crystalline mass is subjected to paper chromatography and its absorption spectrum is examined, it exhibits

an absorption at the wave-length of 253.6 m μ , which shows the presence of 5'-nucleotide in a piece of the crystalline mass. Further, colourisation with the ninhydrin reaction gives a spot corresponding to that of MSG.

(2) It is observed under a polarising microscope that the alkali salt of the 5'-nucleotide is distributed homogeneously in the crystal lattice of MSG.

(3) Any piece of the crystalline mass of this invention is dissolved without forming precipitates perceivable even under a microscope when treated with an aqueous solution of aluminium or calcium salt which is adjusted at about pH 6.

While the aluminium or calcium salt of GA is soluble in water, the aluminium or calcium salt of 5'-nucleotide is barely soluble in water so that it forms white precipitates. For this reason, in known seasoning compositions in which crystalline MSG is coated with an alkali metal salt of 5'-nucleotide, the inner part of the aluminium or calcium salt of GA is dissolved away while the outer aluminium or calcium salt of 5'-nucleotide remains as a precipitate when treated with an aqueous solution of aluminium or calcium salt of pH 6. On the contrary, the crystalline mass of this

invention dissolves in an aqueous solution of aluminium or calcium salt adjusted to pH 6 in the same way as in MSG. This means that the 5'-nucleotide is homogeneously distributed in the crystalline mass of this invention as very fine particles of substantially molecular state.

Figures 2a—d are microscopic photographs of the crystalline mass of this invention and crystalline 5'-nucleotide in an aqueous solution of an aluminium salt adjusted to a pH of 6.

Figures 3e—h are microscopic photographs of the crystalline mass of this invention and crystalline MSG in an aqueous solution of an aluminium salt adjusted at pH 6.

Due to the fine homogeneous crystalline structure, the crystalline mass of this invention dissolves in water more quickly than known seasoning compositions such as a mixture of MSG and 5'-nucleotide or coated MSG with an alkali metal salt of 5'-nucleotide, which makes the flavorful taste of the crystalline mass of this invention stronger. Table 3 shows the result of comparing the time required for dissolution between the crystalline mass of this invention and a known seasoning composition having the same degree of size, respectively.

TABLE 3

	Test 1	Test 2	Test 3
Sample A	12 minutes	3.5 minutes	8 minutes
Sample B	5 minutes	1.6 minutes	1.5 minutes
Sample C	11 minutes	2.5 minutes	5 minutes

Sample A: A mixture of crystalline alkali metal salt of 5'-nucleotide and MSG.

Sample B: The crystalline mass of this invention.

Sample C: Coated MSG with an alkali salt of 5'-nucleotide.

Test 1 shows the time required for dissolution of 0.1 g. of the sample in 10 ml. of water without stirring.

Test 2 shows the time required for dissolution of 0.1 g. of the sample in 10 ml. of water while stirring every 30 seconds.

Test 3 shows the time required for dissolution of 0.1 g. of the sample in 20 ml. of soya sauce while stirring every 30 seconds.

The crystalline mass of this invention has a mesh size ranging from 20 to 200, which is suitable for its use as a seasoning. When using the crystalline mass of this invention, its mesh size is generally over 35, and preferably 65 to 150. As the crystals are usually rod-shaped, the product is still visible with

the naked eye as crystals even when it has a mesh size ranging from 150 to 200.

The advantages of the invention include the following:

- (1) The product is obtainable in a high yield;
- (2) The process for preparing the product is simple;
- (3) Mother liquid may be employed repeatedly;
- (4) The product is rod-shaped, glassy, hard, dry and of very good appearance;
- (5) The content of disodium salt of 5'-nucleotide in the product is substantially 2—10% by weight, which is most suitable as a seasoning condiment;
- (6) The balance between the amount of alkali salt of IMP and GMP in the product is substantially constant; and
- (7) The product has a mesh size ranging from 20 to 200.

These advantages are attributable to the

employment of hydrophilic organic solvent. In particular, the supersaturated degree of the metastable supersaturated solution in the process of this invention is larger than that in an aqueous supersaturated solution, and the metastable supersaturated state in the process of this invention is maintained in a wide range as much as that in plain water. As a result, the crystallisation proceeds smoothly to produce the crystalline mass in a good yield, i.e. 80–90% in general. On the other hand, the crystallisation from an ordinary aqueous solution gives yields of only 50 to 55% at the most. Accordingly, the cost for the equipment is lowered, usually to 2/3, procedures for recovery of the starting materials and the treatment of the mother liquid are also simplified, and the loss of alkali salt of 5'-nucleotide during the process is small, as compared with the case where an aqueous solution is employed.

Even the presence of a contaminant such as a colouring agent does not give any adverse effect in obtaining a product of high quality by the method of this invention. The mother liquid recovered is employable repeatedly as it is, so that the loss of expensive alkali salt of 5'-nucleotide is small.

As the crystallisation proceeds, the concentration of mother liquid becomes lower to make the crystallisation velocity slower in comparison with crystallisation from ordinary water, so that the surface of the product is made glassy, hard and dense. In addition, an increase in the fluidity of the mother liquor makes the collection of the crystalline mass of this invention easier, so that a product of good appearance is obtained.

The following Examples illustrate the invention: Throughout the specification, the mesh size is represented by the Japanese Industrial Standard. MSG contains usually one mole of crystallisation per molecule and the alkali salt of 5'-nucleotide usually seven moles of water of crystallisation per molecule.

In the specification and claims, for the convenience of calculation, the amount of MSG is expressed as containing one mole per molecule of water of crystallisation while the amount of alkali salt of 5'-nucleotide is shown on an anhydrous basis (i.e. as containing no water of crystallisation).

EXAMPLE 1

A solution containing 300 g. of MSG, 12.35 g. of the disodium salt of IMP and 11.8 g. of the disodium salt of GMP in 300 g. of water was concentrated to 520 g. and cooled gradually under gentle stirring. When the temperature dropped to 63°C., 135 ml. of methanol were added dropwise to the solution under gentle stirring, while keeping the temperature constant. The solution was cooled gradually while stirring to 25°C. in 20 hours, whereby 255 g. of a crystalline mass were

obtained. The mass homogeneously contained 3.06% by weight of the disodium salt of IMP and 2.09% by weight of the disodium salt of GMP. The yield was 78.6% by weight. Of the crystalline mass, 85% by weight was 35 to 200 mesh size.

EXAMPLE 2

Crude 5'-nucleotide containing 4.12 kg. of disodium salt of IMP and 3.84 g. of the disodium salt of GMP is added to an aqueous solution containing 120 kg. of MSG. The solution was concentrated to 205 kg. and was cooled gradually with gentle stirring. When the temperature of the solution reached 65°C., 50 l of methanol were added dropwise with gently stirring. The mixture was cooled gradually under gentle stirring to 25°C., whereby 110 kg. of a beautiful crystalline mass were obtained. The mass homogeneously contained 2.66% by weight of the disodium salt of IMP and 1.78% by weight of the disodium salt of GMP. The yield was 86% by weight and the time required for the crystallisation was 15 hours. Of the crystalline mass, 85% by weight was 35 to 200 mesh size.

EXAMPLE 3

A mixture of 202 g. of crude MSG with a crude 5'-nucleotide containing 7.8 g. of disodium salt of IMP and 7.4 g. of the disodium salt of GMP was dissolved in water. The solution was concentrated to 400 g. and was cooled to 60°C. After the addition of 45 ml. of methanol dropwise under gentle stirring, the solution was again cooled gradually under gentle stirring to 25°C., whereby 115 g. of the crystalline mass were obtained. The mass homogeneously contained 5.40% by weight of the disodium salt of IMP and 3.58% by weight of the disodium salt of GMP. The yield was 53% by weight and the time required for the crystallisation was 18 hours. Of the crystalline mass, 80% by weight was 35 to 200 mesh size.

EXAMPLE 4

14 grams of disodium salt of IMP were dissolved in an aqueous solution of 186 g. of MSG. The solution was concentrated to 350 g. and was cooled to 65°C. After the addition of 120 ml. of methanol dropwise under stirring, the solution was cooled gradually under gentle stirring to 25°C., whereby 164 g. of the crystalline mass were obtained. The mass homogeneously contained 6.23% by weight of the disodium salt of IMP. The yield was 82% by weight, and the time required for the crystallisation was 16 hours. Of the crystalline mass, 80% by weight was 35 to 200 mesh size.

EXAMPLE 5

10.6 grams of the diammonium salt of GMP were dissolved in an aqueous solution of 190 g. of MSG. The solution was concentrated to

323 g and was gradually cooled to 65°C. under stirring. 50 ml. of methanol were added dropwise under gentle stirring and the solution was cooled gradually to 25°C., whereby 146 g. of a crystalline mass were obtained. The content of the disodium salt of GMP in the mass was 3.73% by weight. The yield was 72.6% by weight and the time required for the crystallisation was 15 hours.

EXAMPLE 6

A mixture of 109.5 g. of MSG and 8.4 g. of the magnesium salt of IMP was dissolved in water. The aqueous solution was concentrated to make the total volume 195 g., and the solution was adjusted to 65°C., followed by the addition of 40 ml. of ethanol thereto dropwise with gentle stirring. Though partial ethanol separated from water first, it became homogeneous with the progress of the crystallisation. The solution was cooled under gently stirring and when the temperature dropped to 25°C., the crystalline mass was collected. The yield was 85 g. (72% by weight). The content of the disodium salt of IMP in the mass was 3.5% by weight. The time required for crystallisation was 14 hours.

EXAMPLE 7

420 grams of an aqueous solution containing 232.5 g. of MSG., 12.5 g. of the disodium salt of 5'-uridylic acid and 2.5 g. of the disodium salt of 5'-cytidylic acid are adjusted to 75°C., followed by the addition little by little of 170 ml. of dioxane. The solution was gradually cooled under stirring. When the solution had cooled to 25°C., the crystalline mass was collected. The yield was 183 g. (73% by weight). The content of disodium salt of IMP in the mass was 4.5% by weight. 5'-Uridylic acid or 5'-cytidylic acid or their alkali salts were not detectable in the product. The time required for the crystallisation was 15 hours.

EXAMPLE 8

Crude 5'-nucleotide containing 11.2 g. of the disodium salt of IMP, 10.8 g. of the disodium salt of GMP, 5.5 g. of disodium salt of 5'-uridylic acid and 5.5 g. of 5'-cytidylic acid was dissolved in an aqueous solution containing 250 g. of MSG followed by concentrating the whole mixture to make its total weight 464 g. When the temperature reached 60°C., 80 ml. of methanol were added dropwise under gentle stirring. The solution was gradually cooled under gentle stirring. When the solution has cooled to 25°C., the crystalline mass was collected. The yield was 185 g. (65.5% by weight). The time required for the crystallisation was 14 hours. The mass contained 2.4% by weight of the disodium salt of IMP and 1.80% of the disodium salt of GMP. Neither 5'-uridylic acid nor 5'-cytidylic acid was detectable in the product. Of the crystalline mass, 89% by weight was 35 to 200 mesh size.

EXAMPLE 9

A mixture of 114 g. of MSG and 6 g. of crystalline 5'-nucleotide containing 2.53 g. of the disodium salt of IMP and 2.17 g. of the disodium salt of GMP was dissolved in 200 ml. of water, followed by concentrating the whole mixture to make its weight 200 g. 20 ml. of dimethylsulphoxide was added to the solution dropwise under gentle stirring at 65°C. and cooled to 25°C. gradually under gentle stirring, whereby 80 g. of a beautiful crystalline mass were obtained. The mass homogeneously contained 2.38% by weight of the disodium salt of IMP and 1.52% by weight of the disodium salt of GMP. The time required for the crystallisation was 20 hours and the yield was 68.5% by weight. Of the crystalline mass, 89% by weight was 35 to 200 mesh size.

WHAT WE CLAIM IS:—

1. A process for the preparation of a homogeneous crystalline flavour-enhancing mass comprising monosodium glutamate and from 2 to 10% by weight (on the anhydrous basis) of the disodium salt of a flavourous 5'-nucleotide (based on the total weight of 5'-nucleotide and monosodium glutamate), which comprises preparing a hot aqueous solution of an alkali metal, ammonium or magnesium salt of a flavourous 5'-nucleotide and monosodium glutamate in an amount of 20 to 62% by weight (of 5'-nucleotide and monosodium glutamate based on the solution), in which the ratio by weight of the alkali metal, ammonium or magnesium salt of flavourous 5'-nucleotide to monosodium glutamate is in the range of from 2:100 to 12:100, at a temperature above 40°C., adding gradually from 10 to 75% by volume of a freely water-miscible organic solvent to the hot aqueous solution (based on the total volume of solvent and water present) while gently stirring without causing the local temperature of the hot solution to drop rapidly, gradually lowering the temperature of the aqueous mixture at a rate of 1 to 3 degrees centigrade per hour, and collecting the resulting crystalline mass from the aqueous mixture.

2. A process as claimed in claim 1, wherein the salt of the flavourous 5'-nucleotide is a sodium salt of 5'-guanylic acid, potassium salt of 5'-guanylic acid, ammonium salt of 5'-guanylic acid, sodium salt of 5'-inosinic acid, potassium salt of 5'-inosinic acid, ammonium salt of 5'-inosinic acid or magnesium salt of 5'-inosinic acid or a mixture thereof.

3. A process as claimed in claim 1, wherein the freely water-miscible organic solvent is methanol, ethanol, acetone, ethyleneglycol, dioxane, dimethylformamide or dimethylsulphoxide.

4. A process as claimed in claim 1, wherein the 5'-nucleotide is employed as a hydrolysate of nucleic acid.

233 g and was gradually cooled to 65°C. under stirring. 50 ml. of methanol were added dropwise under gentle stirring and the solution was cooled gradually to 25°C., whereby 146 g. of a crystalline mass were obtained. The content of the disodium salt of GMP in the mass was 3.73% by weight. The yield was 72.6% by weight and the time required for the crystallisation was 15 hours.

EXAMPLE 6

A mixture of 109.5 g. of MSG and 8.4 g. of the magnesium salt of IMP was dissolved in water. The aqueous solution was concentrated to make the total volume 195 g., and the solution was adjusted to 65°C., followed by the addition of 40 ml. of ethanol thereto dropwise with gentle stirring. Though partial ethanol separated from water first, it became homogeneous with the progress of the crystallisation. The solution was cooled under gently stirring and when the temperature dropped to 25°C., the crystalline mass was collected. The yield was 85 g. (72% by weight). The content of the disodium salt of IMP in the mass was 3.5% by weight. The time required for crystallisation was 14 hours.

EXAMPLE 7

420 grams of an aqueous solution containing 232.5 g. of MSG., 12.5 g. of the disodium salt of 5'-uridylic acid and 2.5 g. of the disodium salt of 5'-cytidylic acid are adjusted to 75°C., followed by the addition little by little of 170 ml. of dioxane. The solution was gradually cooled under stirring. When the solution had cooled to 25°C., the crystalline mass was collected. The yield was 183 g. (73% by weight). The content of disodium salt of IMP in the mass was 4.5% by weight. 5'-Uridylic acid or 5'-cytidylic acid or their alkali salts were not detectable in the product. The time required for the crystallisation was 15 hours.

EXAMPLE 8

Crude 5'-nucleotide containing 11.2 g. of the disodium salt of IMP, 10.8 g. of the disodium salt of GMP, 5.5 g. of disodium salt of 5'-uridylic acid and 5.5 g. of 5'-cytidylic acid was dissolved in an aqueous solution containing 250 g. of MSG followed by concentrating the whole mixture to make its total weight 464 g. When the temperature reached 60°C., 80 ml. of methanol were added dropwise under gentle stirring. The solution was gradually cooled under gentle stirring. When the solution has cooled to 25°C., the crystalline mass was collected. The yield was 185 g. (65.5% by weight). The time required for the crystallisation was 14 hours. The mass contained 2.4% by weight of the disodium salt of IMP and 1.80% of the disodium salt of GMP. Neither 5'-uridylic acid nor 5'-cytidylic acid was detectable in the product. Of the crystalline mass, 89% by weight was 35 to 200 mesh size.

EXAMPLE 9

A mixture of 114 g. of MSG and 6 g. of crystalline 5'-nucleotide containing 2.53 g. of the disodium salt of IMP and 2.17 g. of the disodium salt of GMP was dissolved in 200 ml. of water, followed by concentrating the whole mixture to make its weight 200 g. 20 ml. of dimethylsulphoxide was added to the solution dropwise under gentle stirring at 65°C. and cooled to 25°C. gradually under gentle stirring, whereby 80 g. of a beautiful crystalline mass were obtained. The mass homogeneously contained 2.38% by weight of the disodium salt of IMP and 1.52% by weight of the disodium salt of GMP. The time required for the crystallisation was 20 hours and the yield was 68.5% by weight. Of the crystalline mass, 89% by weight was 35 to 200 mesh size.

WHAT WE CLAIM IS:—

1. A process for the preparation of a homogeneous crystalline flavour-enhancing mass comprising monosodium glutamate and from 2 to 10% by weight (on the anhydrous basis) of the disodium salt of a flavourous 5'-nucleotide (based on the total weight of 5'-nucleotide and monosodium glutamate), which comprises preparing a hot aqueous solution of an alkali metal, ammonium or magnesium salt of a flavourous 5'-nucleotide and monosodium glutamate in an amount of 20 to 62% by weight (of 5'-nucleotide and monosodium glutamate based on the solution), in which the ratio by weight of the alkali metal, ammonium or magnesium salt of flavourous 5'-nucleotide to monosodium glutamate is in the range of from 2:100 to 12:100, at a temperature above 40°C., adding gradually from 10 to 75% by volume of a freely water-miscible organic solvent to the hot aqueous solution (based on the total volume of solvent and water present) while gently stirring without causing the local temperature of the hot solution to drop rapidly, gradually lowering the temperature of the aqueous mixture at a rate of 1 to 3 degrees centigrade per hour, and collecting the resulting crystalline mass from the aqueous mixture.

2. A process as claimed in claim 1, wherein the salt of the flavourous 5'-nucleotide is a sodium salt of 5'-guanylic acid, potassium salt of 5'-guanylic acid, ammonium salt of 5'-guanylic acid, sodium salt of 5'-inosinic acid, potassium salt of 5'-inosinic acid, ammonium salt of 5'-inosinic acid or magnesium salt of 5'-inosinic acid or a mixture thereof.

3. A process as claimed in claim 1, wherein the freely water-miscible organic solvent is methanol, ethanol, acetone, ethyleneglycol, dioxane, dimethylformamide or dimethylsulphoxide.

4. A process as claimed in claim 1, wherein the 5'-nucleotide is employed as a hydrolysate of nucleic acid.





A process as claimed in claim 1, substantially as described with reference to any of the Examples.

- 5 6. A homogeneous crystalline flavour-enhancing mass comprising monosodium glutamate and from 2 to 10% by weight (on an anhydrous basis) of the disodium salt of a
10 7. A crystalline flavour-enhancing mass when produced by the process claimed in any of claims 1 to 5.

ELKINGTON AND FIFE,
Chartered Patent Agents,
High Holborn House,
52—54 High Holborn,
London, W.C.1.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1968.
Published by the Patent Office, 25 Southampton Buildings, London, W.C.2, from which
copies may be obtained.

