

## ENCAPSULATION

This disclosure relates to flavour encapsulation.

5 The encapsulation of flavours is a very important technology, allowing, as it does, the preservation of flavour until its desired release time. This technology has found its way into a wide variety of consumable compositions, i.e., compositions taken orally, either for ingestion (such as foodstuffs, confectionery, baked goods and beverages) or for spitting out (such as toothpastes and mouthwashes).

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One of the most common materials used for this application is gelatin. Gelatin has many advantages; it is cheap and readily available, it also has unique properties with respect to gelling and swelling behaviour, mouth-feel and specific melting behaviour in the mouth upon consumption. These have combined to make its use widespread.

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Against these advantages, there have arisen numerous disadvantages. Gelatin is an animal product, thus meaning that it cannot be used in vegetarian products. In addition, depending on its source, it may involve religious prohibitions. It is hard to overcome kosher and halal prohibitions with gelatin products. However, finding a substitute for gelatin that can give all its advantages without any of

20 its disadvantages has proved difficult.

It has now been found that it is possible to provide the benefits of gelatin without the drawbacks.

There is therefore provided an encapsulated flavour, comprising a core material, flavour material and a coating material, the core material comprising a finely-divided native starch, xanthan gum

25 and konjac.

There is also provided a method of preparing an encapsulated flavour, comprising the blending of a mixture of native starch, xanthan gum and konjac and a flavour emulsion to give a granulate.

30 Native starches, i.e., non-chemically-modified starches, are well-known and readily-available items of commerce. Typical examples include rice and tapioca starch.

Xanthan gum is a well-known polysaccharide secreted by the bacterium *Xanthomonas campestris*, and it is widely used as a rheology modifier, thickener and stabiliser in foodstuffs and cosmetics.

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Konjac is the root of an Asian plant *Amorphophallus konjac*. It is now widely used in health and dietary foods, because of its nutritional content and its high content of glucomannan fibre, which is noted for its swelling ability. It is available in powder (flour) and gel form. The powder form is preferred for use in this process.

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Although all the materials are well known to the art, it is surprising to find that the combination may be used to replace gelatin and confer on the compositions the desirable qualities of gelatin.

The flavour may be any suitable desired flavour. It is used in the form of an aqueous emulsion. In some cases, the flavour may be emulsified without the need for any emulsifiers, but in general the presence of at least some food-grade emulsifier is beneficial. Typical examples include gum Arabic, modified food starches and OSA starch.

In a particular embodiment, the emulsifier is derived from sorbitan. A particular embodiment is polyoxyethylene sorbitan monooleate, commercially available, for example, under the trade names Tween<sup>TM</sup>, Polysorbate<sup>TM</sup> and Admul<sup>TM</sup>. It has been surprisingly found that the use of these emulsifiers results in emulsifier flavour droplets of unusually small size (down to 1 micron), as opposed to the 3-4 micron size possible with other emulsifiers. The larger the droplets, the greater the flavour loss in the fluidised bed process, so a smaller size brings considerable advantages.

In a typical process, the core material is prepared by mixing the ingredients in a heated fluidised bed. The emulsion of the flavour is then sprayed on to the core material. Spraying is continued until a desired flavour content is attained. Typical fluidised bed equipment include Wurster, rotor granulator and top spray systems.

The fluidised bed equipment is operated according to the normal practices and within the recognised parameters of the art. Typical operating conditions are as follows:

Inlet temperature 60 – 110°C, particularly about 95°C  
Product Temperature 35 – 90°C, particularly about 65°C  
Air flow rate 20 – 140 M<sup>3</sup>/h, particularly about 60 M<sup>3</sup>/h  
Nozzle air pressure 0.5 – 6 bar, particularly about 4 bar

In a further embodiment, at least one protective layer may be applied to the granulate. A protective layer may be any food-grade material capable of forming a coating film, typical examples being cellulosic materials such as methyl and ethyl cellulose, and starch-based materials. This is sprayed as an aqueous solution on to the fluidised flavour granules.

The flavour granules hereinabove described may be used in all kinds of solid comestible products, that is, products taken by mouth either for ingestion or spitting out. There is therefore also provided a solid comestible composition comprising a comestible product base and encapsulated flavour as hereinabove defined.

By “solid” is meant a product that is not fluid, i.e., not a liquid or a spreadable paste. By “comestible product base” is meant all of the art-recognised ingredients that are combined with the

encapsulated flavour to make a comestible product. These will depend on the nature of the particular product, but they include materials such as other flavours, binders and film-forming materials, thickeners, rheology modifiers, extenders and abrasive agents, solvents and diluents, pigments, dyestuffs and colouring matters, preservatives, flavour enhancers and modifiers,  
5 sweeteners, mouthfeel additives, antiseptics and medicinal compounds and compositions, and the like.

Non-limiting examples of comestible products include food products, oral care products, and compositions for admixture to such products, in particular flavour compositions. Flavour  
10 compositions may be added to processed foods during their processing, or they may actually be consumables in their own right, e.g. condiments such as sauces and the like.

Further non-limiting examples of comestible products include confectionery products such as chocolate and candy products, cereal products, baker's products, bread products, gums, chewing  
15 gums, yeast products, salt and spice products, mustard products, vinegar products, sauces (condiments), soups, processed foods, cooked fruits and vegetable products, meat and meat products, egg products, edible oils and fat products, medicaments, food extracts, plant extracts, meat extracts, condiments, sweeteners, nutraceuticals, pharmaceutical and non-pharmaceutical gums, tablets, lozenges and drops.

20 Use of the granules hereinabove described confer the possibility of having a gelatin-free product (thus meeting all the religious and dietary problems caused by the presence of gelation) with all the desirable qualities that the presence of gelatin brings. There is therefore also provided a gelatin-free solid comestible composition comprising a comestible product base and encapsulated flavour  
25 as hereinabove defined

The disclosure is further described with reference to the following non-limiting examples.

#### Example 1

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#### Preparation of particles

The ingredients are shown below:

| Material             | Gram |
|----------------------|------|
| <b>A</b>             |      |
| MD12 <sup>1</sup>    | 175  |
| Gum Arabic           | 350  |
| Isomalt <sup>2</sup> | 175  |

|                         |     |
|-------------------------|-----|
| Water                   | 950 |
| Flavour <sup>3</sup>    | 235 |
| Admul T60K <sup>4</sup> | 7   |
| <b>B</b>                |     |
| Tapioca grits           | 150 |
| Xanthan                 | 50  |
| Konjac                  | 50  |
| <b>C</b>                |     |
| Methyl Cellulose        | 50  |
| Water                   | 575 |

1 Malto Dextrine (dextrose equivalent of 12)

2 sugar alcohol

5 3 Comercially-available peppermint flavour

4 polyoxyethylene (20) sorbitan monooleate

The process was carried out in a rotor granulator operating under the following conditions (with the usual slight practical variations):

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Inlet temperature      100 °C  
Product Temperature      55 °C  
Air flow                      70 m<sup>3</sup>/h  
Nozzle air pressure      1 bar

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Two batches of materials were prepared, the first utilising Stages A and B only ("uncoated granules"), the second additionally utilising C, in which a solution of methyl cellulose is sprayed on to the granules in the fluidised bed "coated granules"). The same process conditions were maintained for both Stages B and C.

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The two sets of granules were then collected and sieved to give granules of 500µM maximum.

## Example 2

25 Testing of granules.

Both sets of granules were incorporated at 2% by weight into the following chewing gum formulation:

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|                            |      |
|----------------------------|------|
| sorbitol                   | 56.3 |
| Solsona-T <sup>1</sup>     | 30.0 |
| mannitol                   | 5.0  |
| Malitol syrup <sup>2</sup> | 8.0  |
| lecithin                   | 0.4  |
| Aspartame <sup>2</sup>     | 0.2  |
| Acesulfame-K <sup>2</sup>  | 0.1  |

1. Commercially-available gum base
2. Sweeteners

5 The granules were incorporated by using a Z- blade mixer at room temperature and kneading the mix of above ingredients until a homogeneous viscous mix (paste) was formed. The viscous paste was divided in chewing pellets of 1.2 gram each.

For comparison, there was added to the same chewing gum base in the same proportion  
10 conventional spray-dried starch flavour particles, carrying the same proportion of the same flavour as those prepared in Example 1. Two different sizes of spray-dried granules were used, of maximum sizes 150 and 75µm.

Evaluation was carried out by an expert panel of 15 members and the data statistically analysed by  
15 ANOVA. The results are shown in Figure 1.

What can clearly be seen from the Figure is that

1. The uncoated granules made as hereinabove described have a rapid and very potent “up-front” release, corresponding to the immediacy of the flavour impact after commencement  
20 of chewing;
2. The coated granules have the same impact, but it is delayed by the extra coating.
3. Both substantially outperform the known spray-dried flavour granules.

## Claims:

- 5 1. An encapsulated flavour, comprising a core material, flavour material and a coating material, the core material comprising a finely-divided native starch, xanthan gum and konjac.
- 10 2. A method of preparing an encapsulated flavour, comprising the blending of a mixture of native starch, xanthan gum and konjac and a flavour emulsion to give a granulate.
- 15 3. A method according to claim 2, in which the flavour emulsion is prepared in the presence of an emulsifier.
4. A method according to claim 3, in which the emulsifier is polyoxyethylene sorbitan monooleate.
5. A solid comestible composition comprising a comestible product base and encapsulated flavour according to claim 1.
- 20 6. A solid comestible composition according to claim 5, which is completely gelatin-free.