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(54) Title: COCOA COMPOSITIONS AND USES THEREOF

(57) Abstract: The present invention relates to processes for providing cocoa compositions with enhanced chocolate taste and/or chocolate aromas. In addition the invention relates to the use of such cocoa compositions for making capsules for beverage dispensers.

Cocoa compositions and uses thereof

Technical field of the invention

The present invention relates to processes for providing cocoa compositions. In particular the present invention relates to beverages containing micronized cocoa particles.

The present invention relates to the use of a cocoa in creamers, beverage powders, ready-to-drink liquid beverage preparations, or beverage capsules suitable for the production of a beverage.

Background of the invention

Cocoa also referred to as cacao is used for a variety of applications in the food industry. These applications include confectionery, bakery, frozen desserts and beverages.

Cocoa powder is challenging to deliver in a soluble form for beverage applications. Retail beverage powders containing cocoa often cause dissolution problems (lump formation, brown spots floating) that are unwanted by the consumer. In capsule applications, incomplete dissolution (part of the powder remains undissolved inside the capsule) leads to weak and inconsistent end-cup quality that is perceived negatively by the consumer. For ready to drink applications, cocoa particles visible settle to the bottom of the bottle. While shaking the bottle before use is commonly accepted, rapid settling of particles within the timeframe of beverage consumption (1-5 min) is regarded as flaw by the consumer. Micronized cocoa powder also tends to get stale and loses taste intensity over time.

Cocoa is micronized in a cocoa refiner or bead mill, then defatted and sold in powder form. Usually an alkalization process is applied to increase the water-solubility of cocoa powder, along with the use of lecithin which is sprayed onto the powders as emulsifier.

The obtained fine powder has a bad flowability which makes it difficult to dose and to mix homogeneously. Due to the high specific surface of the powder the aroma is very sensitive to oxidation and volatiles are lost very quickly. Fresh ground cocoa taste cannot be maintained. The cocoa powder is added into beverage powders by dry mixing. Once mixed within the beverage powder, the cocoa is difficult to reconstitute due to its hydrophobic properties.

Cocoa compositions are also added to capsules for the preparation of a beverage in specifically designed brewing machines already exist on the market. Patent EP 0512468 relates to such a cartridge. Such capsules may be used for preparing cocoa beverages using beverage dispensers such as Nescafe Dolce Gusto® machine. There is a need to produce capsules containing such beverage powder that has a long shelf life and better solubility.
EP 05 22704 relates to a food modifier and process for making same. WO2006/063130 relates to choclate products and ingredients and methods for producing oil-in-water suspensions.

Summary of the invention

A cocoa beverage component usually contains oil and the present invention relates to a process wherein cocoa particles are added into the oil part of a Ready-To-Drink (RTD) beverage, powdered beverage, powder creamer or liquid creamer. The cocoa particles are mixed with oil during production of the beverage and then the oil and cocoa mixture may be wet ground to achieve the desired particle size of cocoa particles and to ensure proper dispersion into the oil phase. The oil and micronized cocoa mixture is then used to produce the beverage composition with chocolate aroma as conventionally for producing a powdered or liquid beverage. The cocoa component may be used as an ingredient in food or beverage products, in the case of a powdered beverage or creamer the cocoa may e.g. be mixed with soluble coffee powder and sweetener to produce a beverage powder useful for producing a coffee beverage containing cocoa. The cocoa component could also be sold as a finished product in its own right. Thus, the invention relates to a process for improving the taste and/or aroma profile of a cocoa composition.
Thus, an object of the present invention relates to processes for providing cocoa compositions with improved aroma profiles.
In particular, it is an object of the present invention to provide cocoa that solves the above mentioned problems of the prior art with aroma release, sedimentation and solubility.
Thus, one aspect of the invention relates to a process for providing a cocoa composition, the process comprising a first mixing step to obtain a first composition and a second mixing step to obtain a second composition, wherein

a) mixing in a first mixing step an oil component with cocoa and grinding the cocoa in oil thereby providing a first composition comprising micronized cocoa with an average particle size below 100 micrometers (μm) incorporated in the

oil component, wherein the first mixing step is done by milling to micronize the cocoa component, wherein wherein oil comprises palm kernel oil, canola oil, soy bean oil, sunflower oil, safflower oil, cotton seed oil, palm oil, milk fat, corn oil, high oleic variants of oils such as high oleic soybean, high oleic canola, high oleic safflower, high oleic sunflower oil, and/or coconut oil;

b) providing an aqueous component comprising milk proteins, plant proteins or combinations thereof thereby providing a second composition,

c) mixing in a second mixing step the first composition with the second composition and

d) homogenising the composition thereby providing an oil-in-water emulsion.

Another aspect of the present invention relates to an oil-in-water emulsified cocoa composition obtainable by the above mentioned process.

Further aspects of the present invention relate to uses of the cocoa compositions of the invention, food ingredients and food products comprising the cocoa compositions.

The present invention will now be described in more detail in the following.

Brief description of Figures

Figure 1 shows a diagrammatic representation of the problem with methods illustrated in prior art such as dry mix grinding (A). This sample shows separation flocculation and sedimentation. While the sample of the present invention (B) shows a consistent uniform product which is achieved by encapsulating the cocoa particles in the oil, or attaching the cocoa particles to the oil droplets, and introducing this to the beverage component as described below. The rounded particles represent the oil droplets in the emulsion. If the emulsion is not stable, the droplets merge together.

Figure 2 shows the particle size distributions of : (A) the reference micronized cocoa powder for dry mixing in beverage compositions (see example 1), d90 is 27μm; and (B): micronized cocoa particles produced in oil, d90 is 17μm.

Figure 3 shows a comparison of the appearance of a beverage preparation made with the above mentioned reference sample (A) vs. sample of present invention (B). At equal cocoa and fat content the sample of the present invention shows a darker beverage giving a perception of more chocolate intensity in the beverage which was further confirmed by sensory data (see table 4 below).

Figure 4 shows the result of a sedimentation test on the prepared beverage for the above mentioned reference sample (A) vs. the sample of the present invention (B). After five minutes of settling time, big amounts of sediments are deposited on a plate immersed into the reference sample (A), while for the sample of the present invention very low amounts of sediments are observed (B). Figure 4 C shows a graph of the continuous and quantitative measurement of the mass of particle sedimentation in the cup with the help of the sedimentation balance as described in example 1 below, the stability of the dispersion of the micronized particles in the cocoa beverage preparation can be evaluated. The solid line represents the reference sample and the dotted line represents the sample of the present invention.

Figure 5 shows the result of a dissolution kinetics assessment as described in Example 3. It can be seen that the product according to the present invention (cocoa micronized in oil) dissolves faster than a reference sample at equal fat and cocoa content (dry mixed).

Detailed description of the invention

As mentioned above, the present invention relates to a process for providing cocoa compositions with improved solubility and having an enhanced taste and/or aroma profile. Thus, an aspect of the present invention relates to a process for providing a cocoa composition, the process comprising

a) mixing in a first mixing step an oil component with cocoa and grinding the cocoa in oil thereby providing a first composition comprising micronized cocoa with an average particle size below 100 micrometers (μm) incorporated in the oil component, wherein the first mixing step is done by milling to micronize the cocoa component, wherein wherein oil comprises palm kernel oil, canola oil, soy bean oil, sunflower oil, safflower oil, cotton seed oil, palm oil, milk fat, corn oil, high oleic variants of oils such as high oleic soybean, high oleic canola, high oleic safflower, high oleic sunflower oil, and/or coconut oil;

b) providing a aqueous component comprising milk proteins, plant proteins or combinations thereof thereby providing a second composition,

c) mixing in a second mixing step the first composition with the second composition and

d) homogenising the composition thereby providing an oil-in-water emulsion.

In one embodiment the process comprises further steps of: adding a bulking and/or sweetener agent(s) to the oil-in-water emulsion; and pasteurizing or commercially sterilizing the oil-in-water emulsion. The bulking agent comprises maltodextrin and the sweetener agent comprises sugar, and /or combination of carbohydrates .

The order of mixing the different components may vary. Preferably, the oil phase and an aqueous phase are prepared separately. Emulsifiers are usually mixed into the oil but may also be added to the aqueous phase. Protein and other milk proteins such as creamer components are dissolved in the aqueous phase. The two phases are then mixed and homogenized to produce an emulsion, which can be used in liquid form or dried. The cocoa particles may be incorporated into (and milled in) only a part of the oil and additional oil may be added afterwards. Thus, in an embodiment one or more further oil components are added after step d), such as before pasteurization and/or drying.
The cocoa particles are preferably micronized after addition to the oil (e.g. by milling), but the cocoa particles may also be provided to the oil in a micronized form.

Emulsifiers are preferably added to the first composition in step a), but it may also be added in other steps. Thus, in an embodiment the one or more emulsifiers are added

- to the first composition in step a); and/or
- to the aqueous component in step b); and/or
- during the mixing step c); and/or
- during the homogenisation step d).

The cocoa composition of the invention may comprise low molecular weight emulsifiers. By a low molecular weight emulsifier is meant an emulsifier with a molecular weight below 1500 g/mol. Emulsions are thermodynamically unstable, and the phases of an emulsion will separate with time. By an emulsifier is meant a compound that stabilises the interface between the two phases of the oil-in-water emulsion and reduces the rate of phase separation. In an embodiment the emulsifiers are selected from the group consisting monoglycerides, diglycerides, acetylated monoglycerides, sorbitan trioleate, glycerol dioleate, sorbitan tristearate, propyleneglycol monostearate, glycerol monooleate and monostearate, sorbitan monooleate, propylene glycol monolaurate, sorbitan monostearate, sodium stearoyl lactylate, calcium stearoyl lactylate, glycerol sorbitan monopalmitate, diacetylated tartaric acid esters of monoglycerides, lecithins, lysolecithins, succinic acid

esters of mono- and/or diglycerides, lactic acid esters of mono- and/or diglycerides, lecithins, lysolecitins, proteins and sucrose esters of fatty acids, lecithin (e.g. soy lecithin, canola lecithin, sunflower lecithin, and/or safflower lecithin), lysolecithins, and combinations thereof.

In one embodiment, the process comprises further steps of HTST or UHT using either direct or indirect process; and Filled on a clean fill, ultra clean fill (ESL) or aseptic filler. The mixing step a) may be performed by different means. In an embodiment the first mixing step a) is done by milling to micronize the cocoa component. In the present context the term "micronize" relates to a process wherein the particles are processed to particle sizes below 100 micrometers (µm), such as in the range 0.1-50 µm, such as in the range 1-30 µm, such as in the range 1-20 µm. Similar the term "micronized" relates to particles with an average particle size below 100 micrometers (µm), such as in the range 0.1-50 µm, such as in the range 1-20 µm, or such as in the range 1-20 µm. Milling is preferably performed in a ball mill by wet milling or dry milling. In one embodiment of the invention, the first mixing step a) is done by milling to micronize the cocoa component. The milling may be for instance a roller milling of cocoa in oil or melted fat or impact milling of cocoa into oil.

The oil component of step a) may be selected from different sources. In one embodiment the oil component of step a) comprises oil selected from the group consisting of palm kernel oil, canola oil, soy bean oil, sunflower oil, safflower oil, cotton seed oil, palm oil, milk fat, corn oil, high oleic variants of oils such as high oleic soybean, high oleic canola, high oleic safflower, high oleic sunflower oil, and/or coconut oil. The oil is preferably present in the creamer composition in an amount of at most about 50% (weight/weight), the amount of oil in the creamer composition may e.g. be between 1% and 40% (weight/weight), such as in the range 5-40%, such as in the range 10-40, such as in the range 5-30%, or such as in the range between 10-30%. In the present context when oil is included in the weight/weight percentages the % relates to the non-water part but including oil (solid content + oils). The total amount of oil component comprising micronized cocoa therein in the aqueous composition may also vary. Thus, in yet a further embodiment the aqueous composition comprises at least 5% (w/w) of the oil component comprising micronized cocoa therein, such as in the range 5-50%, such as 5-40%, such as 5-30%, such as in the range 5-20%, or such as in the range 5-15%. In another embodiment the aqueous

composition comprises at least 20% (w/w) of the oil component comprising micronized cocoa therein. It is to be understood that these weight % includes both the oil and the micronized cocoa therein.

In the context of the present invention, mentioned percentages are weight/weight percentages of dry solids (on a dry matter basis) unless otherwise stated.

The process of the invention may also includes the addition of a creamer component, preferably in an aqueous form. By a creamer composition/ is meant a composition that is intended to be added to a food composition, such as e.g. coffee, to impart specific characteristics such as colour (e.g. whitening effect), flavour, texture, mouthfeel and/or other desired characteristics. Thus the cocoa composition as provided by this invention can also be used as a creamer. The creamer component provided in step b) is in a liquid form, but the final creamer composition of the invention may be in a liquid form or in a powdered (dry) form. In the present context dried cocoa is to be understood as having a moisture content below 10%, preferably below 5% or more preferably below 3% water.

The creamer component may be any ingredient or combination of ingredients useful for inclusion in a aqueous composition. Thus, in an embodiment the aqueous component of step b) comprises a protein, a hydrocolloid, a buffering agent, and/or a sweetener.

The aqueous component preferably comprises protein in the range 0.5-15%, such as 1.5-10% such as 1.5-5%preferably between about 0.1-3% protein, such as between about 0.2-2% protein, more preferably between about 0.5% (weight/weight) and about 1.5% protein. The protein may be any suitable protein, e.g. milk protein, such as casein, caseinate, and whey protein; vegetable protein, e.g. soy and/or pea protein; and/or combinations thereof. The protein is preferably sodium caseinate. The protein in the composition may work as an emulsifier, provide texture, and/or provide whitening effect. Too low levels of protein may reduce the stability of the liquid creamer. At too high protein levels the viscosity of the product may be higher than desired and too high for liquid processing.

The aqueous component may comprise a hydrocolloid. Hydrocolloids may help to improve physical stability of the composition. Suitable hydrocolloids may e.g. be carrageenan, such as kappa-carragenan, iota-carragenan, and/or lambda-carragenan; starch, e.g. modified starch; cellulose, e.g. microcrystalline cellulose, methyl cellulose, or carboxy-methyl cellulose; agar-agar; gelatine; gellan (e.g., high acyl, low acyl); guar gum; gum Arabic;

kojac; locust bean gum; pectin; sodium alginate; maltodextrin (bulking agent); tracaganth; xanthan; or a combination thereof.

The aqueous component of the present invention may further include a buffering agent. The buffering agent can prevent undesired creaming or precipitation of the creamer upon addition into a hot, acidic environment such as coffee. The buffering agent can e.g. be monophosphates, diphosphates, sodium mono- and bicarbonates, potassium mono- and bicarbonates, or a combination thereof. Preferred buffers are salts such as potassium phosphate, dipotassium phosphate, potassium hydrophosphate, sodium bicarbonate, sodium citrate, sodium phosphate, disodium phosphate, sodium hydrophosphate, and sodium tripolyphosphate. The buffer may e.g. be present in an amount of about 0.1 to about 3% by weight of the creamer.

The aqueous component of the present invention may further include one or more additional ingredients such as flavors, sweeteners, colorants, antioxidants (e.g. lipid antioxidants), or a combination thereof. Sweeteners can include, for example, sucrose, fructose, dextrose, maltose, dextrin, levulose, tagatose, galactose, corn syrup solids and other natural or artificial sweeteners. Sugarless sweeteners can include, but are not limited to, sugar alcohols such as maltitol, xylitol, sorbitol, erythritol, mannitol, isomalt, lactitol, hydrogenated starch hydrolysates, and the like, alone or in combination. Usage level of the flavors, sweeteners and colorants will vary greatly and will depend on such factors as potency of the sweetener, desired sweetness of the product, level and type of flavor used and cost considerations. Combinations of sugar and/or sugarless sweeteners may be used. In one embodiment, a sweetener is present in the creamer composition of the invention at a concentration ranging from about 5-90% by weight of the total composition, such as in the range 20-90%, preferably such as 20-70%. In another embodiment, the sweetener concentration ranges from about 40% to about 60% by weight of the total composition. In a preferred embodiment the sweetener of step e) is glucose syrup.

In a preferred embodiment the aqueous component comprises sodium caseinate, dipotassium phosphate, sodium hexametaphosphate, trisodium citrate, sodium chloride and water. In yet an embodiment the aqueous component of step b) is a non-dairy creamer. When sodium caseinate is processed, it is so materially altered that both dairy scientists and government regulators no longer regard it as a true dairy substance. This is why

sodium caseinate can be an ingredient in non-dairy products according to FDA's regulation.

Examples of typical aqueous compositions are presented in tables 1-3 below.

Table 1: Non-dairy creamers

Ingredients (in % by weight)	**Non-dairy (NDC)**		
	LOW FAT	REGULAR	HIGH FAT
Milk solids non-fat (SNF)	no	no	no
Casein / caseinate	1.5 - 3.0	1.5 - 3.0	1.5 - 3.0
Lactose / sweet whey	no	110	no
Glucose syrup	80-90	50-60	40-50
Milk fat	no	no	no
Vegetable fat	10-20	30-35	40-45
Emulsifiers	yes	yes	yes
Buffer salts	yes	yes	yes
Flavours	optional	optional	optional
Colorants	optional	optional	optional
Flowing agents	optional	optional	optional
Moisture	1-3	1-3	1-3

Table 2: Filled dairy creamers

Ingredients (in % by weight)	**Filled dairy (FDC)**		
	LOW FAT	REGULAR	HIGH FAT
Milk solids non-fat (SNF)	70-90	20 - 40	20 - 40
Casein / caseinate	optional	optional	optional
Lactose /sweet whey	0-10	20 - 40	20 - 40
Glucose syrup	optional	optional	optional
Milk fat	no	no	no
Vegetable fat	0-10	25-30	35-40
Emulsifiers	no	no	no
Buffer salts	yes	yes	yes
Flavours	optional	optional	optionai
Colorants	optional	optional	optional
Flowing agents	optional	optional	optional
Moisture	1-3	1-3	1-3

Table 3: Full dairy creamers

Ingredients (in % by weight)	Full dairy
Milk solids non-fat (SNF)	30 - 40
Casein / caseinate	optional
Lactose /sweet whey	0 - 40
Glucose syrup	no
Milk fat	15 - 30
Vegetable fat	No
Emulsifiers	no
Buffer salts	yes
Flavours	optional
Colorants	optional
Flowing agents	optional
Moisture	1-3

The skilled person may produce other variants of creamers. Thus, the above creamer compositions are mere examples of aqueous compositions.

The process may also include a pasteurizing step. Thus, in yet another embodiment the pasteurizing step is performed at a minimum temperature of 81°C for at least 5 seconds. The cocoa composition as obtained after the pasteurizing step can be used for making RTD beverages. The process may also include a drying step. Thus, in a further embodiment the drying step is performed by spray drying, vacuum band drying, roller drying or freeze drying. The cocoa composition as obtained after the drying step can be used for making creamers for use in beverage industry for example as milk additive for coffee and tea beverage. The cocoa composition after dry mixing may be used to make beverage powders such a chocolate/malt beverages, coffee mixes, bakery and culinary products for retail purposes. Such cocoa composition may also be used for preparation of capsules to be used in a beverage dispenser.

As previously mentioned the cocoa may also be in a dried form. Therefore in yet an aspect the invention relates to an oil-in-water emulsified dry cocoa composition comprising

- an oil component comprising micronized cocoa incorporated therein; and
- an aqueous component, e.g. comprising sodium caseinate.

The amount of micronized cocoa may also be defined in relation to the amount of oil in which it is incorporated. Thus, in another embodiment the weight/weight ratio (or ratio by weight) between the amount of micronized cocoa incorporated in the oil to the amount of

oil is in the range 0.01:1 – 2:1, such as 0.05:1 – 2:1, such as 0.1:1 – 2:1, such as 0.1:1 – 1:1, such as 0.4:1 – 1:1, such as 0.6:1 – 1:1, such as 0.8:1 – 1, or such as 1:1.

In the context of the present invention, the terms "ratio by weight" "(weight/weight)" or "weight/weight ratio" refers to the ratio between the weights of the mentioned compounds.

It is to be understood that the cocoa compositions of the invention may both be in a dry format (moisture content below 10%, preferably below 5%, and even more preferably below 3%) or in a liquid state.

Examples of preferred cocoa compositions of the invention include:

A cocoa composition according to the invention comprising

- 5-50% (w/w) of the oil component comprising micronized cocoa incorporated therein, wherein the micronized cocoa constitutes 2.5-70% of the total weight of the oil component comprising micronized cocoa incorporated therein; and
- one or more protein components, e.g. including sodium caseinate.

A cocoa composition according to the invention comprising

- 5-50% (w/w) of the oil component comprising micronized cocoa incorporated therein, wherein the micronized cocoa constitutes 2.5-70% of the total weight of the oil component comprising micronized cocoa incorporated therein; and
- 10-50% (w/w) of one or more protein components, e.g. including sodium caseinate.

A cocoa composition according to the invention comprising

- 5-50% (w/w) of the oil component comprising micronized cocoa incorporated therein, wherein the micronized cocoa constitutes 2.5-70% of the total weight of the oil component comprising micronized cocoa incorporated therein;
- 10-50% (w/w) of one or more protein components, e.g. including sodium caseinate; and
- 10-70% (w/w) of a sugar source, such as glucose syrup.

It should be noted that embodiments and features described in the context of one of the aspects of the present invention also apply to the other aspects of the invention.

All patent and non-patent references cited in the present application, are hereby incorporated by reference in their entirety.

The invention will now be described in further details in the following non-limiting examples.

Examples

Example 1

Process for providing a Ready-To-Drink (RTD) beverage

Methods

Cocoa powder (10/12 % fat, GT78 from Cargill®, particle size distribution given in Fig. 2A) was mixed with pre-heated palm kernel oil and micronized using a wet bead mill (Hosokawa Alpine Hydro-Mill 90 AHM, T=65°C, zirconium oxide bead 1.7/1.9 mm, 3000 RPM, TS50).

After one passage through the mill the size distribution of the micronized particles is characterized by a $d_{90,3}$ of 17 μm, i.e 90% of the mass belongs to particles with a diameter smaller than 17 micrometers, as shown in Fig 2B.

In parallel skim milk (95%) and sugar (5%) were mixed and stirred in a vessel at 50°C. Both the oily and the aqueous preparation were then mixed and stirred at 50°C. The final mix was pre-heated (80°C), subjected to UHT treatment by direct steam injection (APV-HTST at 145°C during 5 sec), flash-cooled to 80°C and homogenized (APV-HTST). The final liquid beverage contains 93.5% skim milk, 4% sugar, 2% fat and 0.5% micronized cocoa powder.

A reference cocoa RTD beverage at equal composition was prepared, where the cocoa was not added via the oil phase as described in the current invention, but mixed into the skim milk together with the sugar. The particle size distribution of the reference micronized cocoa powder is shown in Figure 2A. It is characterized by a $d_{90,3}$ of 27 μm.

Sedimentation test

150 ml of the beverage sample was poured into in a cup at T=25°C. The beverage was allowed a settling time of 5 minutes and the sedimentation test was done by measuring the mass of sediments in the cup on a submersed plate using a sedimentation balance: Mettler Toledo XP404S Excellence Plus with Density Determination Kit. Balance Link Software V 4.02.

Results

Measurement of mass of sediments in the cup on submersed plate is shown on Figure 4 A for the reference RTD beverage and in Figure 4 B for the beverage made with cocoa particles micronized in oil according to the current invention. Based on continuous and quantitative measurement of particle sedimentation in the cup with the help of the

sedimentation balance, the stability of the dispersion of the micronized particles in the RTD beverage preparation can be evaluated. The result is presented in Fig. 4C. A continuous increase of the sedimented cocoa particle mass for the reference sample (dispersion of dry micronized cocoa particles into the RTD beverage preparation) is observed, whereas cocoa micronized in oil does not settle within 5 min time. The mass on the sedimentation balance even decreases slightly, since some light particles are floating to the top of the cup. No sediments are found for the micronized cocoa in oil sample.

Example 2

Process for providing a creamer

Methods

Cocoa powder (10/12% fat, type GT78 from Cargill®) was mixed with pre-heated palm kernel oil and micronized using a wet bead mill (Hosokawa Alpine Hydro-Mill 90 AHM, T=65°C, zirconium oxide bead 1.7/1.9 mm, 3000 RPM, TS50).

After one passage through the mill the size distribution of the micronized particles is characterized by a $d_{90,3}$ of 17 μm, i.e 90% of the mass belongs to particles with a diameter smaller than 17 micrometers.

The oil containing micronized cocoa particles was then mixed with monoglyceride Dimodan™ and Panodan™ (Dupont). In parallel typical non-dairy creamer ingredients (sodium caseinate, dipotassium phosphate, sodium hexametaphosphate, trisodium citrate, and sodium chloride) were mixed in water and stirred in a vessel at 50°C.

These two mixes were then mixed and stirred at 50°C with the addition of glucose syrup. The final mix was homogenized (APV-HTST) and pasteurized (APV-HTST at 85°C during 5 sec). The pasteurized mix was then spray-dried (NIRO SD-6.3-N) at 160°C.

In this example, 15% of the final creamer dry weight is represented by cocoa particles added via the oil phase. Vegetable oil represents 35% of the dry weight of the creamer preparation.

Sensory data

The sensory characteristics of cocoa creamer compositions were judged by sensory panellists. The creamer preparation according to the present invention (#965) was evaluated versus a reference sample (#547) at equal composition. For the reference sample 15% micronized cocoa powder was added in a dry mixing step to a reference creamer

preparation made with pure vegetable oil (35%). It was found by the panel that the composition of the present invention exhibited a smooth and stable suspension with enhanced chocolate taste and aromas. Flavor was perceived as more round for the sample containing cocoa micronized in oil and mouthfeel was perceived as less watery and having more body then the reference sample at equal composition, for which slight sandiness in mouth was noted by the panelists. Sedimentation was absent during consumption as described above. Detailed observations are represented in Table 4.

Table 4: Sensory evaluation of creamer compositions containing micronized cocoa

Sample	Odor	Appearance	Flavor	Mouthfeel
#965 Cocoa powder micronized in palm kernel oil	Cocoa Powder 6 Milk Sweet 1 Fruity 2 Neutral 1 Alkaline 2	Darker sediment 7 Thick layer 3 More sediment than #547 3	More round Cocoa Sweet More dairy	Less fatty than ref Watery More body
#547 Cocoa powder added in dry mix to creamer powder (reference)	Cocoa powder 5 Sweet Fruity Roasted Cacao 2 Milky Cereal	Milky layer at the surface 5 Very few sediment 5 Bit of foam Oil in surface	Bitter 3 Astringent 4 Cocoa 4 Fruity Carboard 2 Roasted cocoa	Slight sandiness

Example 3

Process for providing a beverage powder

Methods

The creamer powder from Example 2 is taken and used as an ingredient in a powdered beverage preparation. For this purpose, the creamer is dry mixed with sugar and milk powder. A typical beverage powder composition comprises 45% creamer, 15% cocoa powder, 30% sugar and 10% milk powder. The obtained powder is filled in sachets and provides and instant cocoa beverage upon reconstitution with hot water. In another use the described powdered beverage preparation is filled into capsules and provides a chocolate beverage upon reconstitution with the help of a beverage system such as Nescafé Dolce Gusto.

Dissolution kinetics analysis

The term "dissolution" refers to the reconstitution of the beverage powder in a liquid. The term t90 refers to the time taken for 90% weight of the powder to be dissolved in a liquid. This time t90 can measured accurately by means of electrical conductivity, i.e using the device Metrohm module 856. A water bath is kept at constant temperature. The conductivity probe is introduced into the liquid and kept, until a steady state electrical conductivity is measured. Adding powder into the liquid starts the measurement. Stirring can be applied with the help of a magnetic stirrer. Ions released upon dissolution of the tablet increase the electrical conductivity of the medium. By dissolving the tablet completely, a plateau of the electrical conductivity is reached. The time t90 is defined as the point of time, when 90% of the total conductivity transition from the initial to the final steady state value is reached. For more details consult the Metrohm user manual: http://partners.metrohm.com/GetDocument?action=get_dms_document&docid=1432097

Results

A glass beaker containing 400 ml water was kept at 80°C. The beaker was equipped with an electrical conductivity probe and a magnetic stirrer turning at 250 RPM. A portion of 7 g of the beverage powder according to Example 3 was dosed into the beaker and the conductivity measurement was started. The evolution of the electrical conductivity, which is proportional to the amount of solid dissolved, was monitored for 600s. Typically a plateau is formed after 50-100 s, indicating complete dissolution.

For comparison, a reference sample was produced containing the same amount of cocoa powder and possessing the same overall fat content, where the cocoa is incorporated as dry mix into the beverage powder composition. The same dissolution test was performed using the reference powder.

The time points where 10%, 50% and 90% respectively of the conductivity change from the start to the steady state value were reached are represented in Figure 5 for both the reference sample and the beverage powder containing cocoa micronized in oil.

It can be seen from the results that the incorporation of micronized cocoa into the creamer matrix brings a significant benefit in terms of dissolution kinetics over a traditional beverage powder preparation containing dry mixed cocoa powder at equal cocoa and fat content.

Example 4

Process for providing a creamer stabilized by wheat protein

Methods

Cocoa powder (10/12% fat, type GT78 from Cargill®) was mixed with pre-heated palm kernel oil and micronized using a wet bead mill (Hosokawa Alpine Hydro-Mill 90 AHM, T=65°C, zirconium oxide bead 1.7/1.9 mm, 3000 RPM, TS50).

After one passage through the mill the size distribution of the micronized particles is characterized by a $d_{90,3}$ of 17 μm, i.e 90% of the mass belongs to particles with a diameter smaller than 17 micrometers.

The oil containing micronized cocoa particles was then mixed with monoglyceride Dimodan™ and Panodan™ (Dupont). In parallel typical ingredients for a non-dairy creamer stabilized by plant protein (wheat protein, dipotassium phosphate, sodium hexametaphosphate, trisodium citrate, and sodium chloride) were mixed in water and stirred in a vessel at 50°C.

These two mixes were then mixed and stirred at 50°C with the addition of glucose syrup. The final mix was homogenized (APV-HTST) and pasteurized (APV-HTST at 85°C during 5 sec). The pasteurized mix was then spray-dried (NIRO SD-6.3-N) at 160°C.

In this example, 15% of the final creamer dry weight is represented by cocoa particles added via the oil phase. Vegetable oil represents 35% of the dry weight of the creamer preparation. Wheat protein represents 2.2 % of the dry weight of the creamer preparation.

Example 5

Process for providing a beverage powder including a creamer stabilized by wheat protein

Methods

The creamer powder from Example 4 is taken and used as an ingredient in a powdered beverage preparation. For this purpose, the creamer is dry mixed with sugar and milk powder. A typical beverage powder composition comprises 45% creamer, 15% cocoa powder, 30% sugar and 10% milk powder. The obtained powder is filled in sachets and provides and instant cocoa beverage upon reconstitution with hot water. In another use the described powdered beverage preparation is filled into capsules and provides a chocolate beverage upon reconstitution with the help of a beverage system such as Nescafé Dolce Gusto.

Claims

1. A process for providing a cocoa composition, the process comprising a first mixing step to obtain a first composition and a second mixing step to obtain a second composition; wherein

a) mixing in a first mixing step an oil component with cocoa, and grinding the cocoa in oil thereby providing a first composition comprising micronized cocoa particles with an average particle size below 100 micrometers (μm) incorporated in the oil component, wherein the first mixing step is done by milling to micronize the cocoa component, wherein wherein oil comprises palm kernel oil, canola oil, soy bean oil, sunflower oil, safflower oil, cotton seed oil, palm oil, milk fat, corn oil, high oleic variants of oils such as high oleic soybean, high oleic canola, high oleic safflower, high oleic sunflower oil, and/or coconut oil;

b) providing an aqueous component comprising milk proteins, plant proteins or combinations thereof thereby providing a second composition,

c) mixing in a second mixing step the first composition with the second composition and

d) homogenising the composition thereby providing an oil-in-water emulsion.

2. The process of claim 1 wherein the second composition is a milk protein and wherein the milk protein comprises sodium caseinate.

3. The process according to claim 1, wherein the process comprises further steps of:

- adding a bulking and/or a sweetener agent(s) to the oil-in-water emulsion; and
- pasteurizing or commercially sterilizing the oil-in-water emulsion.

4. The process according to claim 3, wherein the bulking agent comprises maltodextrin and the sweetener agent comprises sugar, combination of carbohydrates and/or fibers.

5. The process according to any one of the claims 1 to 4, wherein the process comprises further steps of

- drying the oil-in-water emulsion; and

- providing a cocoa composition.

6. The process according to any one of the claims 1 to 4, wherein the process comprises further steps of

- HTST or UHT using either direct or indirect process; and
- Filled on a clean fill, ultra clean fill (ESL) or aseptic filler.

7. The process according to any one of the claims 1 to 6, wherein one or more emulsifiers are added

- to the first composition in step a); and/or
- to the aqueous component in step b); and/or
- during the mixing step c); and/or
- during the homogenisation step d).

8. The process according to any one of the claims 1 to 7, wherein oil is preferably present in the creamer composition in an amount of at most about 50% (w/w), wherein w/w represents percentage of dry solids.

9. The process according to any of the preceding claims, wherein the aqueous component of step b) comprises skim milk solids, caseinate, e.g. sodium caseinate, and/or whey protein.

10. The process according to any of the preceding claims, wherein the weight/weight ratio between the amount of cocoa incorporated in the oil and the amount of oil in the first composition of step a) is in the range 0.01:1 – 2:1, such as 0.05:1 – 2:1, such as 0.1:1 – 2:1, such as 0.1:1 – 1:1, such as 0.4:1 – 1:1, such as 0.6:1 – 1:1, such as 0.8:1 – 1, or such as 1:1.

11. The process according to claim 10, wherein the composition of mixing step c) comprises at least 5% (w/w) of the oil component comprising micronized cocoa therein, such as in the range 5-70%, such as 5-50%, such as 5-30%, such as in the range 5-20%, or such as in the range 5-10%; wherein w/w represents percentage of dry solids.

12. The process according to any of claims 10 or 11 wherein the composition of mixing step c) comprises:

- 5-50% (w/w) of the oil component comprising micronized cocoa incorporated therein, wherein the micronized cocoa constitutes 2.5-70% of the total weight of the oil component comprising micronized cocoa incorporated therein;
- 1-50% (w/w) of one or more protein components, e.g. including sodium caseinate; and
- 5-70% (w/w) of a sugar source.

13. A cocoa composition obtainable according the process of any one of the claims 1 to 12.

14. Use of the cocoa composition of claim 13 for producing a RTD beverage, powder creamer, liquid creamer, coffee mix, cocoa malt beverage, chocolate, bakery or culinary product.

15. Use of the cocoa composition of claim 13 for preparation of capsules to be used in a beverage dispenser.

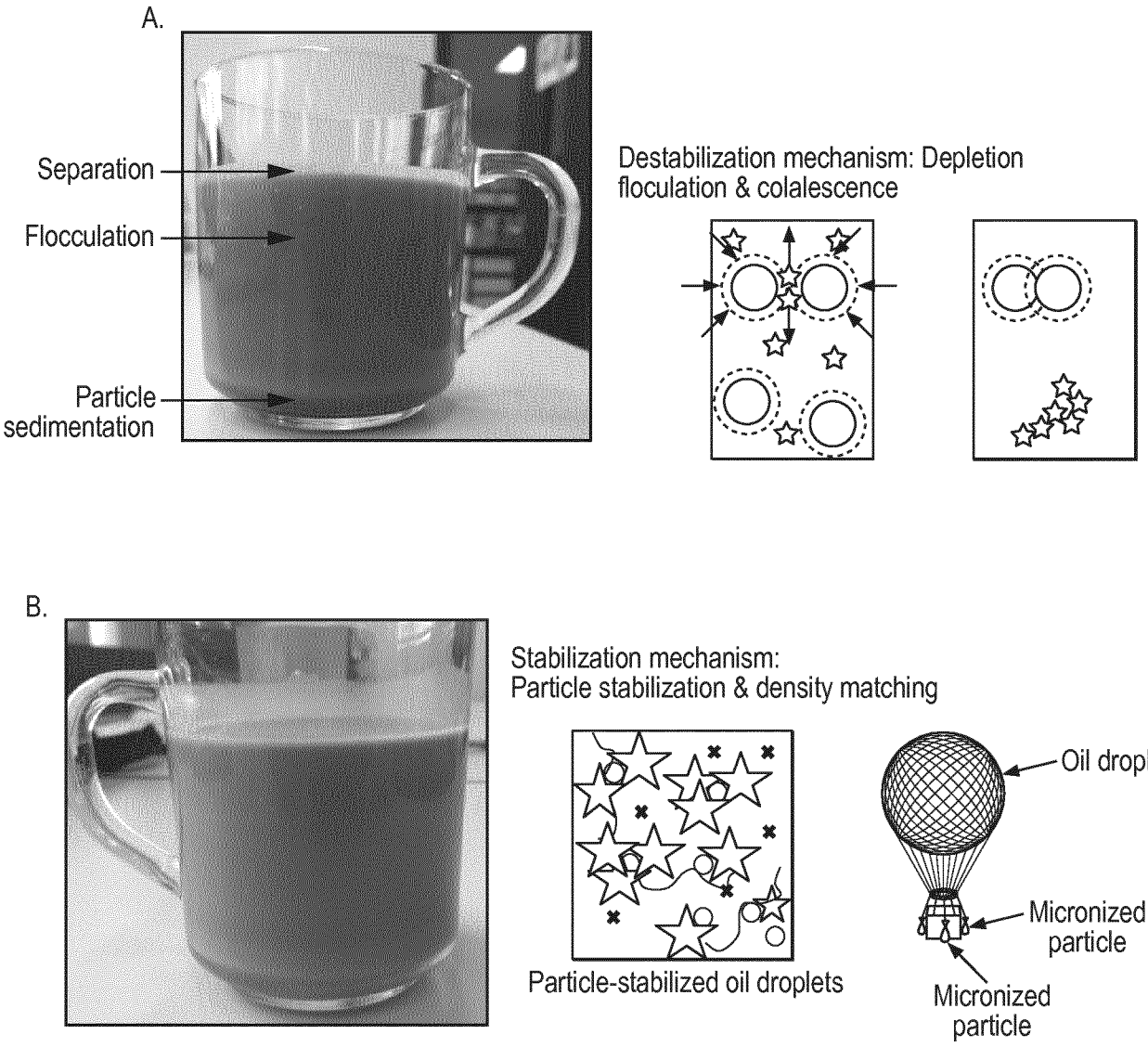
A.
Separation
Flocculation
Particle sedimentation
Destabilization mechanism: Depletion floculation & colalescence
B.
Stabilization mechanism:
Particle stabilization & density matching
Particle-stabilized oil droplets
Oil droplet
Micronized particle
Micronized particle

FIG. 1

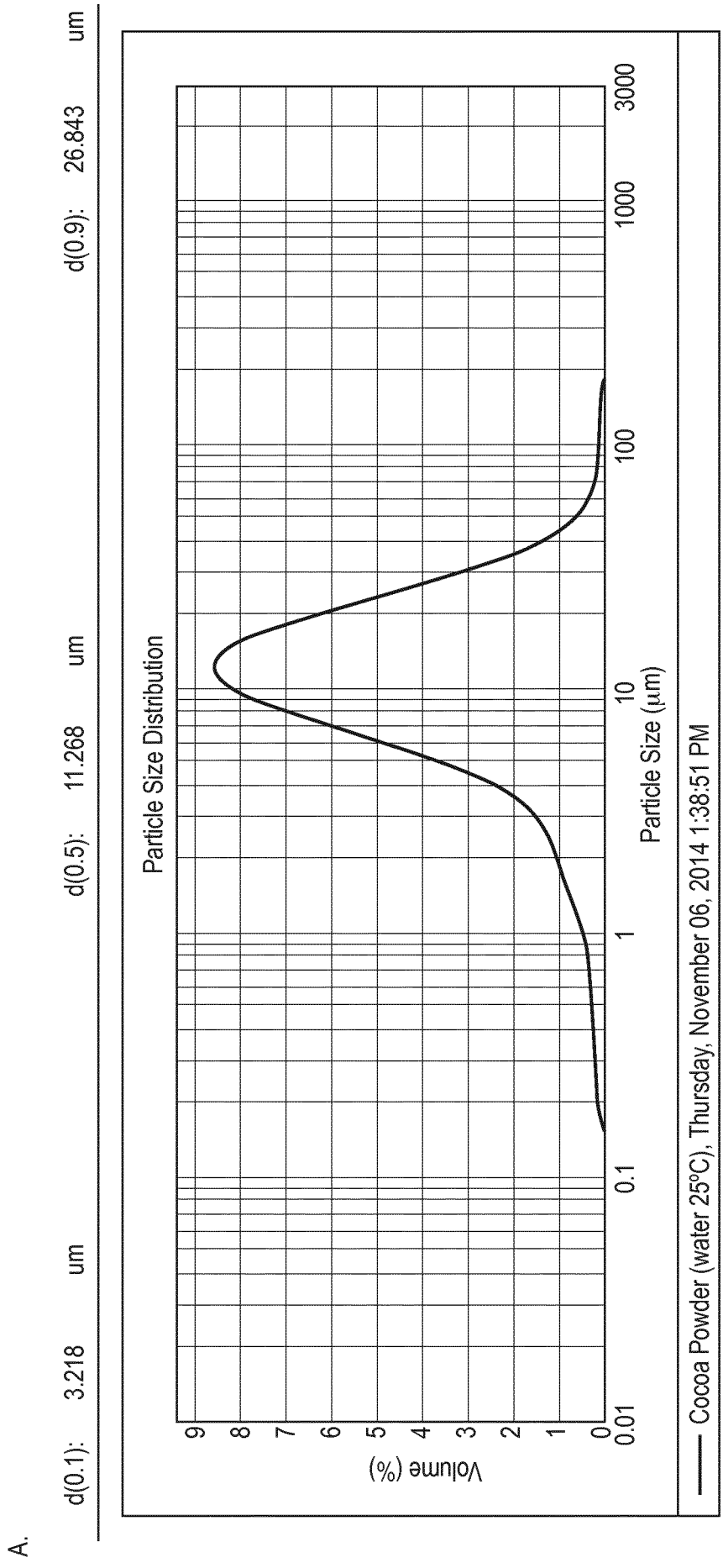
A.
d(0.1): 3.218 um
d(0.5): 11.268 um
d(0.9): 26.843 um
Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
9
0.01
0.1
1
10
100
1000
3000
Particle Size (µm)
Cocoa Powder (water 25°C), Thursday, November 06, 2014 1:38:51 PM

FIG. 2

B.

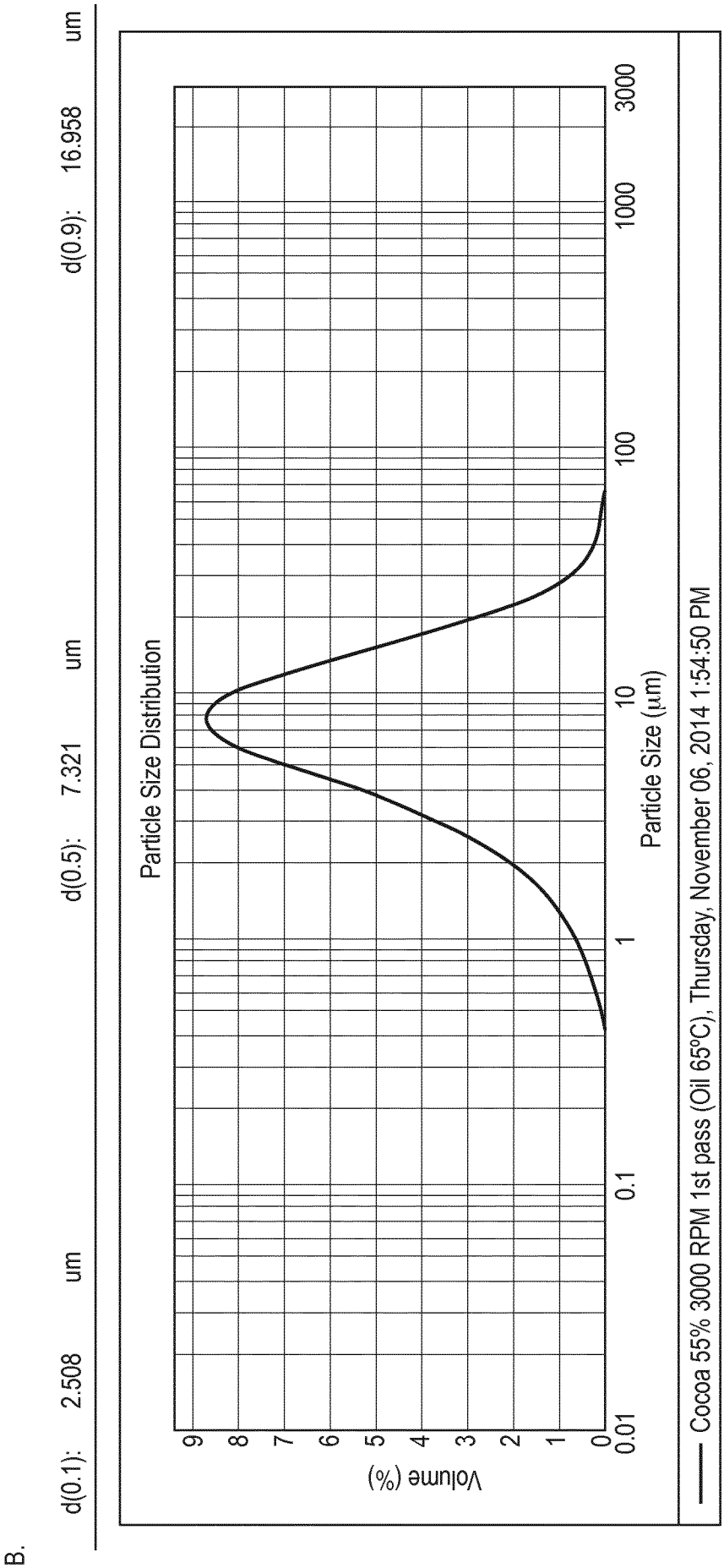
d(0.1): 2.508 um
d(0.5): 7.321 um
d(0.9): 16.958 um
Particle Size Distribution
Volume (%)
0
1
2
3
4
5
6
7
8
9
0.01
0.1
1
10
100
1000
3000
Particle Size (µm)
Cocoa 55% 3000 RPM 1st pass (Oil 65°C), Thursday, November 06, 2014 1:54:50 PM

FIG. 2

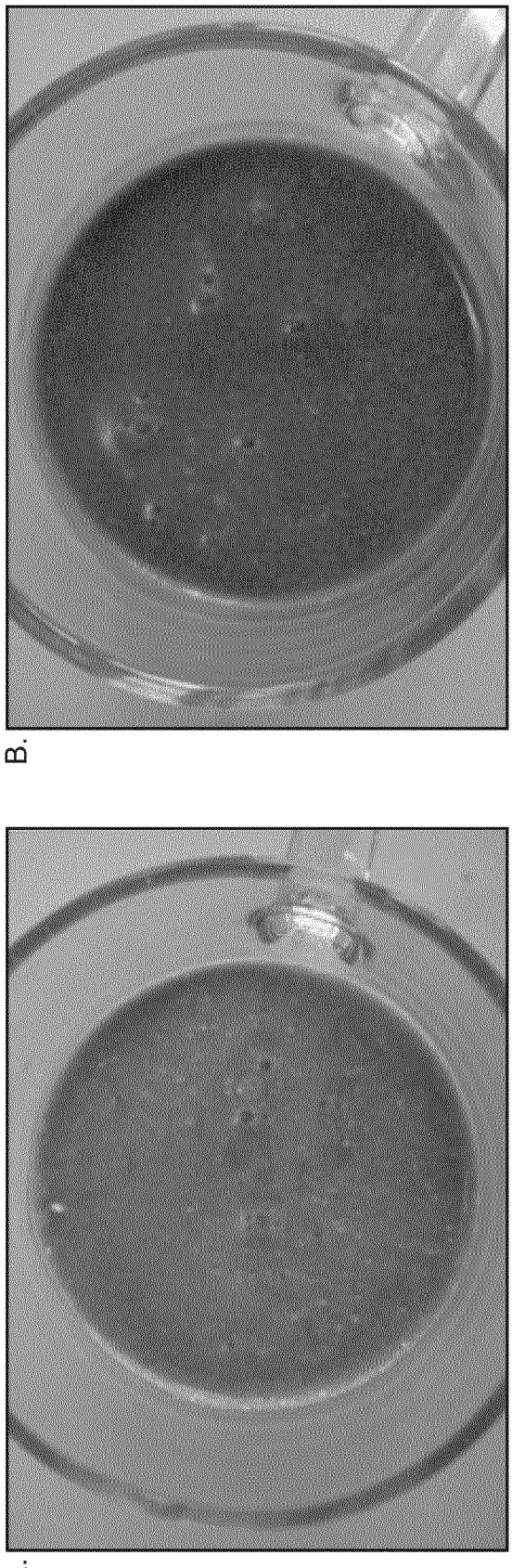

FIG. 3

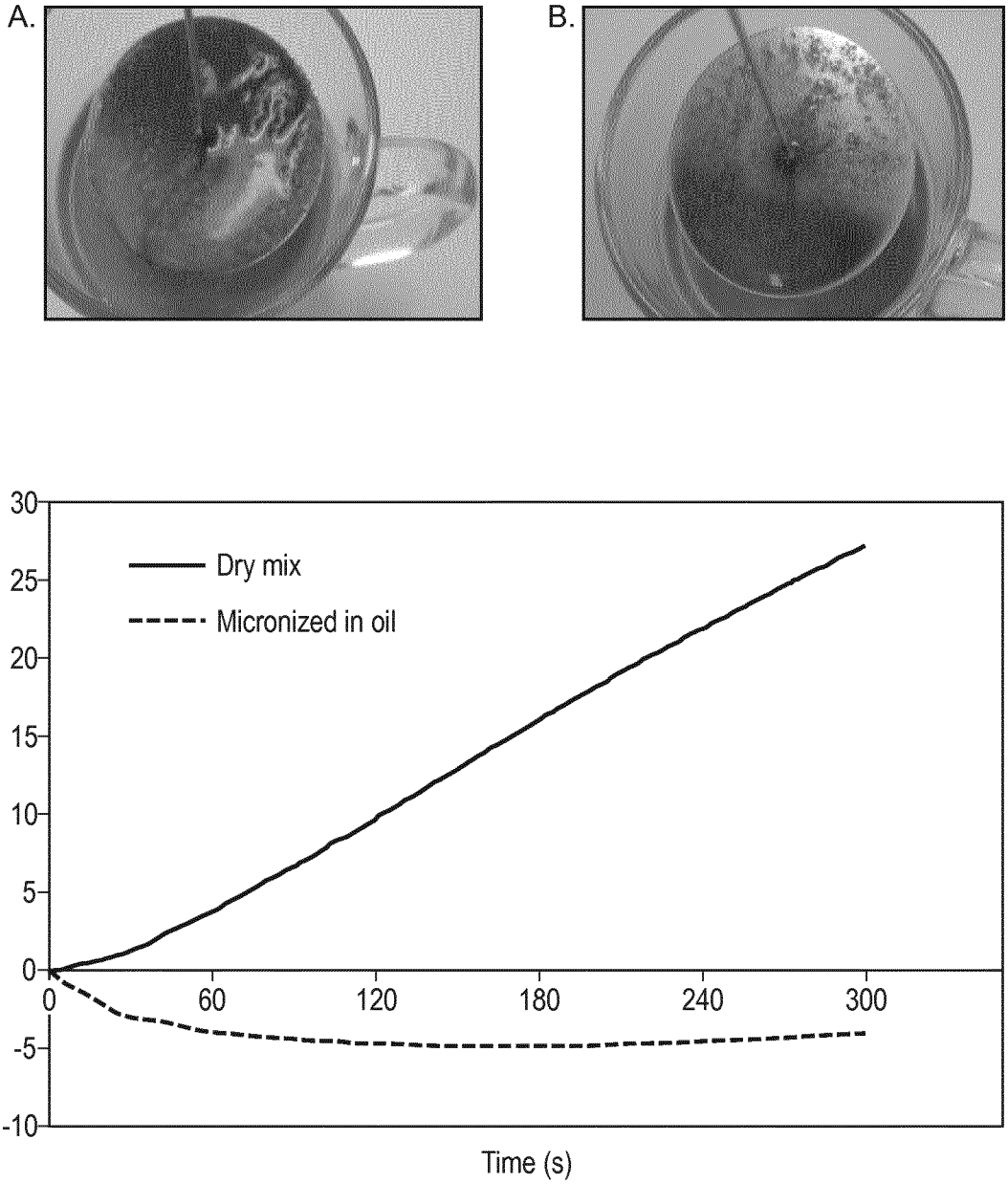
A.
B.
C.
30
25
20
15
10
5
0
-5
-10
Mass (mg)
Dry mix
Micronized in oil
0
60
120
180
240
300
Time (s)

FIG. 4

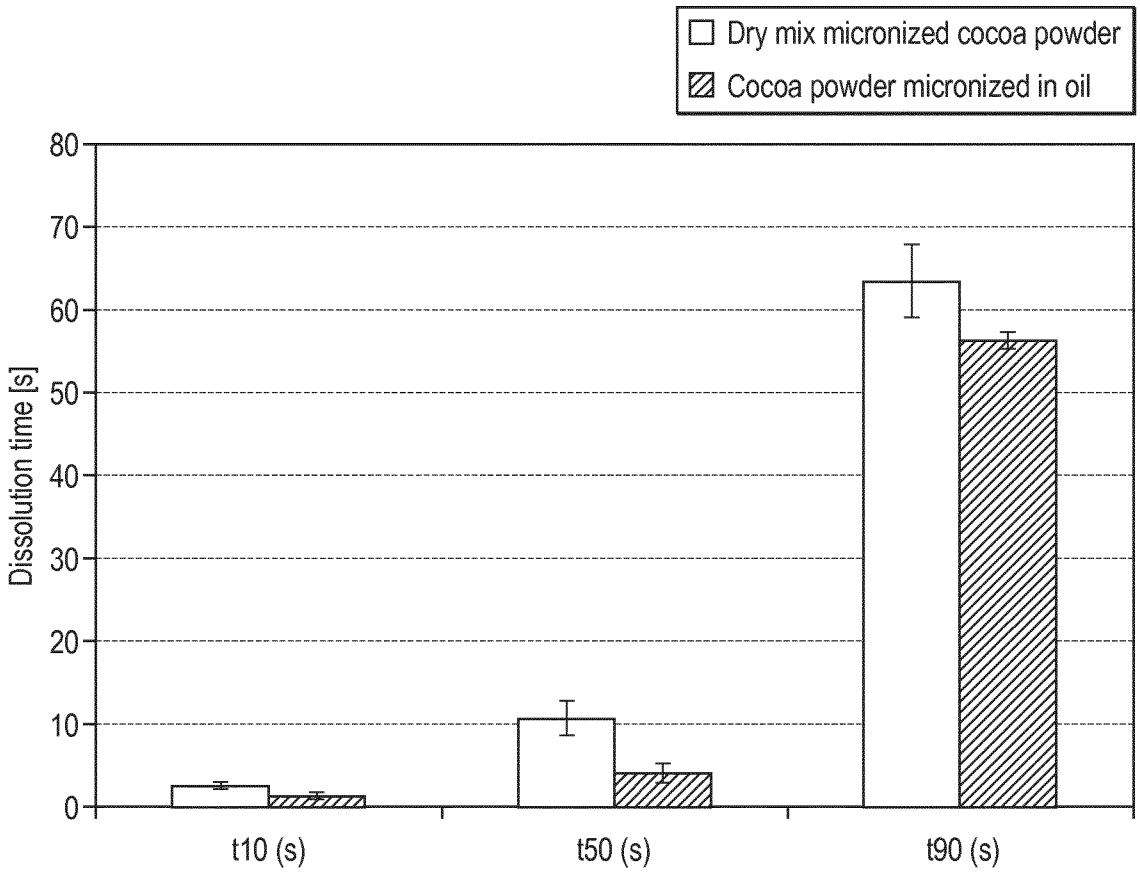
Dry mix micronized cocoa powder
Cocoa powder micronized in oil
Dissolution time [s]
80
70
60
50
40
30
20
10
0
t10 (s)
t50 (s)
t90 (s)

FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/080277

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23C11/04 A23C11/08 A23G1/00 A23G1/46
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23C A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, BIOSIS, FSTA, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 522 704 A2 (GEN FOODS INC [US] GEN FOODS INC [GB] CPC INTERNATIONAL INC [US]) 13 January 1993 (1993-01-13) claims 3-7 page 3, lines 19-24 page 4, lines 11-16	13-15
X	WO 2006/063130 A1 (HERSHEY CO [US]; HANSELMANN WILLIAM [US]) 15 June 2006 (2006-06-15) claims 2-3,7-11,21-23 page 4, lines 22-32	13-15

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
10 March 2016	21/03/2016

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Heirbaut, Marc

1

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
T	Anonymous: "Alpine AHM ¦ Hosokawa Micron Powder Systems", , 12 June 2015 (2015-06-12), XP055195442, Retrieved from the Internet: URL:http://hmicronpowder.com/products/alpine-ahm [retrieved on 2015-06-12]	
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2015/080277

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