

KARITENE IN FOOD PRODUCTS**FIELD OF THE INVENTION**

The invention relates to karitene stabilised emulsions and food products comprising said emulsions. In particular, the invention relates to the use of karitene as an emulsifier in food products and the use of the karitene to enhance the organoleptic perception of the food products.

BACKGROUND OF THE INVENTION

A great many natural and processed food products contain emulsions. In some cases, the entire food product is an emulsion (for example, certain types of sausages) whereas in others the emulsion forms a component of the food product. In the case of processed foods, emulsification of the food products or a component thereof often happens during manufacture of the food product. Emulsions are common components of food products such as milk, cream, butter, margarine, juice, soup, cake, pastry, mayonnaise, sausages, cream liqueur, coffee creamer, sauces, meats (in particular processed meats), ice cream, and many others. An emulsion is a fine dispersion of minute droplets of a first liquid in a second liquid in which the first liquid is not soluble or miscible. The dispersed droplets are referred to as the dispersed phase and the liquid in which they are dispersed is referred to as the continuous phase. Emulsions are typically divided into oil-in-water emulsions in which water forms a continuous phase with oil droplets dispersed therein and water-in-oil emulsions in which the oil forms the continuous phase with water droplets dispersed therein. Both of these types of emulsions are found in food products. The presence of the emulsion in the food products typically provides structure and texture to the food products. Emulsions typically keep the food matrix of the food product intact and prevent phase separation which often leads to stickiness in the food products. Emulsions often don't stay stable for a sufficiently long time and can undesirably separate into their constituent oil and water phases. This is a particular problem with food products that may be stored for a long period of time. In order to minimise and prevent separation of emulsions, emulsifiers are often added to food products to stabilise the emulsions. Examples of emulsifiers often added to food products include egg lecithin, mono- and diglycerides, polysorbates and hydrocolloids such as guar gum, gellan gum and carrageenan. Certain food ingredients also often contain emulsifying components (for example certain vegetable oils that contain mono- and diglycerides).

Despite the widespread use of emulsifiers in food products, there has been an increased negative public perception associated with their use due to the general undesirability of using chemical additives in food products and a desire for “clean label” food products. In Europe, chemical food additives are allocated an “E number” by the European Food Safety Authority (EFSA). In recent years, there has been an increased desire by consumers for food products that are free of or contain only low amounts of E numbers.

Many processed food products such as those listed above comprise emulsions formed from oil/fat and water. Examples of fats and oils used in the emulsions include animal fats such as tallow, lard, poultry fat and milk fat, and also plant-derived fats such as palm oil, coconut oil, palm kernel oil, shea butter, soyabean oil, sunflower oil, rapeseed oil, safflower oil and olive oil. Shea butter has been added to food products such as breads and pastries, sauces, dressings, plant-based food products, and confectionary. Shea butter is an oil that is extracted from the nut of the African shea tree. It is used in food products such as those discussed above and also in many cosmetic products. Shea butter, like most plant derived fats comprises mostly triglycerides. Shea butter also comprises a small fraction of compounds known collectively as karitene. Karitene refers to several highly viscous rubber-like macromolecular substances. Karitene is found in shea butter at a concentration of around 3% by weight. Karitene has the formula: $\text{H}[-\text{CH}_2-\text{C}(\text{CH}_3)=\text{CH}-\text{CH}_2]_{n+2}\text{H}$, where n is typically between 100 and 10,000. The value of n varies from molecule to molecule and is always greater than 100. In the majority of cases n is less than 10,000 but may occasionally be higher than 10,000. In these cases, the karitene has a similar molecular structure to natural rubber.

Before shea butter is used in food products and cosmetic products, the karitene is typically removed from shea butter since it renders the shea butter oxidatively unstable due to the large number of carbon-carbon double bonds present in the molecule. Karitene is typically removed from the shea butter by various processes such as acetone fractionation or hexane fractionation. The removed karitene is generally considered to be a waste product with limited use other than being burned as a fuel.

US2015/0264956 discusses the use of shea butter fractions as a cocoa butter equivalent in chocolate and other confectionary products. The document discusses that karitene is removed from the shea butter before inclusion of the shea butter in food products due to the problems associated with the oxidation of the karitene; the fact that the karitene causes problems with filtering of the shea butter; and that it causes taste corruption of the confectionary products.

SUMMARY OF THE INVENTION

The present invention is based on the surprising finding that karitene can act as an emulsifier in food products as well as imparting desirable organoleptic properties to the food products such as improved texture and homogeneity. The karitene has also been unexpectedly found to provide an improved umami flavour, meatiness perception and mouthfeel to meat and meat analogue food products as well as imparting various advantages during processes for manufacturing these food products. According to a first aspect of the invention, there is provided an emulsion composition comprising one or more oils and water; wherein the emulsion composition comprises from 0.1% to 7.5% of karitene by total weight of water and the one or more oils present in the emulsion composition; and wherein the emulsion composition comprises at least 1.0% of karitene by weight of the total amount of the one or more oils present in the emulsion composition.

The terms emulsion composition and emulsion as used herein are used, consistent with their normal meaning in the art, to refer to a mixture of two immiscible liquids (typically water and oil). In the emulsion or emulsion composition, one liquid forms a continuous phase with droplets of a dispersed phase dispersed therein. The boundary between the continuous phase and dispersed phase is referred to as the interface. Typically, the emulsion droplets of the dispersed phase have a mean droplet diameter of from 0.1 μm to 100 μm . The continuous phase may be water and the dispersed phase may be oil in which case the emulsion is referred to as an oil-in-water emulsion. Alternatively, the continuous phase may be oil and the dispersed phase water in which case the emulsion is referred to as a water-in-oil emulsion. The terms emulsion composition and emulsion as used herein are intended to cover both of these types of emulsion unless stated otherwise.

The terms emulsion and emulsion composition as used herein are also used to refer to meat emulsions when used in the context of meat or meat analogue food products. A meat emulsion is a multiphase system where the continuous phase comprises water and dissolved, gelled and suspended proteins (and salts if present), and the dispersed phase comprises fats and optionally water insoluble proteins. In the continuous phase, the dissolved proteins form a stable protein matrix gel that entraps the water. The proteins can be either animal proteins (such as in the meat products) or non-animal proteins (such as in meat analogue products).

The emulsion composition typically comprises karitene in an amount of from 1.0% to 20%; preferably from 1.0% to 10.0%; more preferably from 1.5% to 7.5% (including 2.0% to 6.0%); and most preferably from 2.0% to 5.0% (including 3.0% to 5.0% and 4.0% to 5.0%) by weight of the total amount of the one or more oils present in the emulsion composition.

Typically, the emulsion composition comprises karitene in an amount of from 0.1% to 5% by total weight of water and the one or more oils present in the emulsion composition. Preferably, the emulsion composition comprises karitene in an amount of from 0.5% to 5% (such as 1.5% to 3.5%) by total weight of water and the one or more oils present in the emulsion composition.

The term karitene as used herein is used to refer to the group of compounds that occur naturally in shea butter that have the following formula: $H[-CH_2-C(CH_3)=CH-CH_2]_n+2H$, where n is between 100 and 10,000.

The emulsion composition may comprise any suitable amount of oil and water suitable for forming an emulsion.

Typically, the one or more oils are present in the emulsion composition in a total amount of from 1% to 99% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 1% to 99% by weight of the total amount of water and oil present in the emulsion composition.

Preferably, the one or more oils are present in the emulsion composition in a total amount of from 10% to 90% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 10% to 90% by weight of the total amount of water and oil present in the emulsion composition.

More preferably, the one or more oils are present in the emulsion composition in a total amount of from 15% to 90% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 10% to 85% by weight of the total amount of water and oil present in the emulsion composition.

As discussed above, the emulsion composition may be a water-in-oil emulsion or an oil-in-water emulsion. Typically, water-in-oil emulsions will form where the emulsion

composition comprises relatively more oil than water and oil-in-water emulsions will form where the emulsion composition comprise relatively more water than oil.

In some instances, the one or more oils are present in the emulsion composition in a total amount of from 50% to 99% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 1% to 50% by weight of the total amount of water and oil present in the emulsion composition. Preferably, in these instances, the one or more oils are present in the emulsion composition in a total amount of from 70% to 99% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 1% to 30% by weight of the total amount of water and oil present in the emulsion composition. Typically, in these instances, the emulsion composition is a water-in-oil emulsion.

In other instances, the one or more oils are present in the emulsion composition in a total amount of from 1% to 70% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 30% to 99% by weight of the total amount of water and oil present in the emulsion composition. Preferably, in these instances, the one or more oils are present in the emulsion composition in a total amount of from 1% to 60% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 40% to 99% by weight of the total amount of water and oil present in the emulsion composition. More preferably, in these instances, the one or more oils are present in the emulsion composition in a total amount of from 1% to 45% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 55% to 99% by weight of the total amount of water and oil present in the emulsion composition. Most preferably, the one or more oils are present in the emulsion composition in a total amount of from 5% to 30% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 70% to 95% by weight of the total amount of water and oil present in the emulsion composition. In these instances, typically, the emulsion composition is an oil-in-water emulsion composition.

The emulsion composition comprises one or more oils. The oils can be any known fat or oil suitable for forming an emulsion with water. Typically, the one or more oils comprise one or more edible oils since the emulsions are primarily intended for use in food products.

Preferably, the one or more oils comprise one or more triglyceride oils, although the emulsions of the invention are extendible to other edible oils such as diglyceride or monoglyceride oils. Preferably, the one or more triglyceride oils are non-hydrogenated triglyceride oils.

The term "fat" as used herein refers to glyceride fats and oils containing fatty acid acyl groups and does not imply any particular melting point. The term "glyceride oil" is used synonymously with "fat" herein.

The term "oil" as used herein also does not imply any particular melting point for the oil.

The term "fatty acid", as used herein, refers to straight chain saturated or unsaturated (including mono- and poly unsaturated) carboxylic acids having 8 to 24 carbon atoms. A fatty acid having x carbon atoms and y double bonds may be denoted C_x:_y. For example, palmitic acid may denoted C16:0, oleic acid may denoted C18:1. Percentages of fatty acids in compositions referred to herein include acyl groups in tri-, di- and mono-glycerides present in the glycerides and are based on the total weight of C8 to C24 fatty acids. The fatty acid profile (i.e. composition) may be determined, for example, by fatty acid methyl ester analysis (FAME) using gas chromatography according to ISO 12966-2 and ISO 12966.4.

Triglyceride content may be determined for example based on molecular weight differences (Carbon Number (CN)) by AOCS Ce 5-86. The notation triglyceride CN_{xx} denotes triglycerides having xx carbon atoms in the fatty acyl groups, e.g. CN54 includes tristearin. Amounts of triglycerides specified with each carbon number (CN) as is customary terminology in the art are percentages by weight based on total triglycerides of CN26 to CN62 present in the fat or oil.

The one or more triglyceride oils may comprise any edible triglyceride oil. Typically, the one or more oils comprise one or more plant-derived triglyceride oils, one or more animal-derived triglyceride oils, or a combination thereof.

Examples of triglyceride oils derived from animals that may be used in the emulsion compositions of the invention include milk fat, tallow, lard, poultry fat and other animal derived oils. The use of animal derived triglyceride oils in the emulsion compositions may be preferable when, for example, the emulsion composition is intended for use in a meat product such as processed meat products.

Preferably, the emulsion composition comprises one or more plant-derived triglyceride oils. More preferably, the one or more oils comprise high oleic sunflower oil, sunflower oil, rapeseed oil, high oleic rapeseed oil, soybean oil, linseed oil, olive oil, corn oil, cottonseed oil, groundnut oil, safflower oil, high oleic safflower oil, peanut oil, rice oil, camelina oil, sesame oil, walnut oil, palm fat, coconut fat, shea butter, cocoa butter, allanblackia fat, kokum fat, mango kernel fat, sal fat, illipe butter, palm kernel fat, babassu fat, any fractions thereof, any interesterified forms thereof, or any combinations thereof. Still more preferably, the one or more oils comprise palm fat, coconut fat, shea butter, cocoa butter, allanblackia fat, kokum fat, mango kernel fat, sal fat, illipe butter, palm kernel fat, babassu fat, any fractions thereof, any interesterified forms thereof, or any combinations thereof.

Most preferably, the one or more oils comprise shea butter, any fractions thereof, any interesterified forms thereof, or any combinations thereof. Most preferably of all, the one or more oils comprise shea olein.

Where shea butter is used in food products (either as the sole fat present or in combination with other fats), there is no need for the shea butter to have the karitene removed before use. Where the shea butter is to be used in emulsions in the food products, the karitene can remain in the shea butter so that it acts as the emulsifier in the food product. This is advantageous as it means that no additional emulsifiers need to be added to the food products meaning that they can desirably be marketed as clean label products since the karitene is a natural component of the shea butter. The cost of additional emulsifiers can also be avoided as well as the costs of carrying out karitene removal processes on the shea butter.

Alternatively, where it is not desired for shea butter to be included in the food products but it is desired to include other fats, karitene that has been removed from shea butter can still be added to the food products to act as a "clean label" emulsifier.

In some instances, the emulsion composition may have karitene added thereto so as to increase the karitene content of the emulsion composition to within the amounts described above. This may be desirable, for example, where the emulsion composition does not comprise shea butter or where shea butter present in the emulsion composition does not comprise the necessary amount of karitene. The karitene added to the emulsion compositions may have been itself previously extracted from shea butter or a fraction thereof using karitene extraction processes known in the art.

The emulsion composition of the invention may also comprise mixtures of shea butter with one or more additional oils such as the oils described above, provided that the karitene content of the emulsion composition are within the limits described above.

Where shea butter, a fraction thereof or interesterified form thereof is used in the emulsion composition, the emulsion composition comprises triglycerides typically found in shea butter. It will be appreciated by the skilled person that the triglycerides present and their relative amounts may vary depending on whether or not the shea butter has been interesterified prior to use.

Typically, the one or more oils comprise SOS triglycerides in an amount of from 0.1% to 25% by weight; preferably from 0.5% to 15% by weight; and more preferably from 1% to 10% by weight of the total amount of the one or more oils present in the emulsion composition.

As discussed above, the emulsion composition may comprise interesterified fats or blends of fats (such as shea butter or other fats described above). For example, the emulsion composition may comprise an interesterified fat such as an interesterified fat blend. The interesterified fat or interesterified fat blend may be produced by chemical interesterification, enzymatic interesterification, or a combination thereof. Processes for the preparation of interesterified fats are known in the art, and are discussed in, for example, Dijkstra, A. J. Interesterification. In: *The Lipids Handbook* 3rd Edition, pages 285 – 300 (F. D. Gunstone, J. L. Harwood, and A. J. Dijkstra (eds.), Taylor & Francis Group LLC, Boca Raton, FL) (2007).

The emulsion composition also comprises water. The amount of water is as described above. Reference to 'water' herein is intended to include drinking water, demineralized water or distilled water, unless specifically indicated. Preferably, the water employed in connection with the present invention is demineralised or distilled water. As the skilled person will appreciate, deionized water is also a sub-class of demineralized water.

As discussed above, the emulsion composition comprises karitene as the emulsifier. However, optionally, the emulsion composition may also comprise one or more additional emulsifiers such as food grade emulsifiers. Examples of such emulsifiers include lecithin (such as egg lecithin), mono- and diglycerides, polysorbates and hydrocolloids such as guar gum, gellan gum and carrageenan. However, preferably, the emulsion composition is free or substantially free of emulsifiers other than the karitene.

The emulsion composition may also optionally include any other ingredients typically present in emulsion compositions such as typical ingredients of edible emulsion compositions intended for use in food products.

According to a second aspect of the invention, there is provided a food product comprising an emulsion comprising one or more oils and water; wherein the food product comprises karitene in an amount of from 0.1% to 7.5% by weight of the food product; and wherein the food product comprises at least 1.0% of karitene by weight of the total amount of the one or more oils present in the food product.

Typically, the food product comprises karitene in an amount of from 0.1% to 5.0% by weight of the food product. Preferably, the food product comprises karitene in an amount of from 0.2% to 5.0% (such as 1.5% to 3.5%) by weight of the food product. More preferably, the food product comprises karitene in an amount of from 0.2% to 3.0% by weight of the food product.

Where the food product is a food product that comprises a significant amount by weight of components other than oil and water (for example meat analogue compositions that may comprise protein, polysaccharides and other ingredients), the karitene is typically present in the food product at the lower end of the ranges discussed above. For example, in some instances, the food product may comprise karitene in an amount of from 0.1% to 2.5% by weight of the food product.

Where the food product is a food product that does not comprise a significant amount of ingredients other than oil and water (for example mayonnaise or certain salad dressings), the karitene is typically present in the food product at the upper end of the ranges discussed above. For example, in some instances, the food product may comprise karitene in an amount of from 1% to 7.5% by weight of the food product (including 2% to 6%) or from 1% to 5% (such as 4% to 5%) by weight of the food product.

Preferably, the emulsion in the food product is an emulsion composition as described above in the context of the first aspect of the invention.

Typically, the food product is a meat analogue food product; a meat food product; a seafood analogue food product, a confectionary food product; a chocolate food product; or a chocolate-like food product; a bakery food product; a soup; a mayonnaise; a salad dressing; or a sauce.

Where the food product is a meat analogue food product, a meat food product or a bakery product, the one or more oils are typically present in the emulsion composition in a total amount of from 1% to 70% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 30% to 99% by weight of the total amount of water and oil present in the emulsion composition. Preferably, the one or more oils are present in the emulsion composition in a total amount of from 1% to 60% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 40% to 99% by weight of the total amount of water and oil present in the emulsion composition. More preferably, the one or more oils are present in the emulsion composition in a total amount of from 1% to 45% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 55% to 99% by weight of the total amount of water and oil present in the emulsion composition. Most preferably, the one or more oils are present in the emulsion composition in a total amount of from 5% to 30% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 70% to 95% by weight of the total amount of water and oil present in the emulsion composition. In these instances, typically, the emulsion composition is an oil-in-water emulsion composition.

In other instances, the food product is a confectionary food product; a chocolate food product; or a chocolate-like food product; and the one or more oils are present in the emulsion composition in a total amount of from 50% to 99% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 1% to 50% by weight of the total amount of water and oil present in the emulsion composition. More preferably, the one or more oils are present in the emulsion composition in a total amount of from 70% to 99% by weight of the total amount of water and oil present in the emulsion composition; and the water is present in the emulsion composition in an amount of from 1% to 30% by weight of the total amount of water and oil present in the emulsion composition. In these instances, preferably, the emulsion composition is a water-in-oil emulsion.

In preferable embodiments, the food product is suitable for consumption by vegetarians and vegans. Accordingly, in preferable embodiments, the food product is substantially free of animal protein, and more preferably, the food product is free of animal protein.

In preferable embodiments, the food product is substantially free of animal-derived products, and more preferably, the food product is free of animal-derived products.

However, in some embodiments, the food product may comprise animal-derived products such as animal derived proteins or fats. Accordingly, in some embodiments, the food product further comprises one or more animal-derived products such as animal oils, marine oils, animal-derived proteins, animal-derived polysaccharides, or any combination thereof. In some embodiments, the one or more animal-derived products comprise animal milk proteins, animal milk fats, or a combination thereof. In these embodiments, the food product may be suitable for consumption by vegetarians on the basis that they comprise non-animal protein and proteins or fats derived from animal milk. These food products are suitable for consumption by vegetarians since they do not include fats or proteins derived from meat. However, it will of course be understood that such food products are not suitable for consumption by vegans.

In embodiments where the food product comprises one or more animal-derived products, the one or more animal-derived products are typically present in the food products in an amount of from 1% to 20% by weight of the food product.

Meat analogue food products and meat products

The food product can be a meat analogue food product or a meat food product.

Preferably, the food product comprising the emulsion is a meat analogue food product formed from 2% to 30% by weight of fat; from 30% to 70% by weight of water; and from 2% to 40% by weight of a non-animal protein.

Typically, the meat analogue food product is a vegetarian or vegan meat substitute food product. Preferably, the vegetarian or vegan meat substitute food product is a burger, sausage, meat ball, nugget, patty, mince product, meatloaf, frankfurter, bologna, mortadella, pepperoni, salami, pate, meat loaf, or other product intended to mimic conventional meat-based food products.

The meat analogue or meat food product can be an uncooked food product, a cooked food product, or a partially cooked food product.

The meat food product or meat analogue food product comprises water. The water can be any of the types of water discussed above in the context of the emulsion of the first aspect of the invention. The food product may comprise water provided from the emulsion, and optionally, additional water that is not present in the form of an emulsion. The weight

percentages given above for the amount of water present in the meat analogue food product refers to both water added in its own right during manufacture of the meat analogue food product, and also to any water present in other components of the meat analogue product (such as water present in the emulsion), or water bound to any protein, as discussed in further detail below.

Preferably, the meat analogue food product comprises fat in an amount of from 7.5% to 25% by weight of the food product; and more preferably from 10% to 20% by weight of the food product.

Any suitable fat can be used in the food products. For example, any of the fats discussed above in the context of the emulsion composition of the first aspect of the invention can be used. It will be appreciated by the skilled person that where the food product is a meat analogue food product, the fat is preferably a non-animal fat such as the plant derived fats discussed above. In contrast, where the food product is a meat food product the fat is typically animal derived. However, certain food products may comprise both animal derived fat and plant derived fat.

Preferably, the food product comprises water in an amount of from 50% to 70% by weight of the food product.

The meat or meat analogue food products of the invention comprise one or more proteins. Meat analogue food products of the invention preferably comprise one or more non-animal proteins, such as one or more proteins derived from fungi or plants, fermentation derived proteins, or a combination thereof.

It will be appreciated that where the food product is a meat analogue food product, the protein will preferably be non-animal protein. In contrast, where the food product is a meat food product, the protein will typically comprise animal derived proteins such as protein derived from pork, poultry, beef, fish or mammalian milk. The food product may also comprise protein derived from both animal and plant sources.

Typically, the non-animal protein comprises plant protein. Preferably, the plant protein is selected from algae protein, black bean protein, canola wheat protein, chickpea protein, fava protein, lentil protein, lupin bean protein, mung bean protein, oat protein, pea protein, potato protein, rice protein, soy protein, sunflower seed protein, wheat protein, white bean protein, and protein isolates or concentrates thereof. In other embodiments, the non-animal protein comprises seitan, rice protein, mushroom protein, legume protein, tempeh,

yam flour, tofu, mycoprotein, peanut flour, yuba, or a combination thereof.

More preferably, the non-animal protein comprises pea protein, or a concentrate or isolate thereof. Most preferably, the pea protein comprises pea protein isolate.

The meat analogue food product or meat food product may comprise just one type of non-animal protein. Alternatively, the food product may comprise more than one type of non-animal protein.

In some instances, the non-animal protein comprises texturized vegetable proteins, preferably wherein the texturized vegetable proteins comprise texturized pea proteins, texturized fava proteins, texturized soy proteins, texturized wheat proteins or a combination thereof.

The non-animal protein is present in the meat analogue food product or meat product in a total amount of from 2% to 40% by weight of the meat analogue or meat food product. Preferably, the non-animal protein is present in the food product in a total amount of from 5% to 25% by weight of the food product, and more preferably from 5% to 15% by weight of the food product. In some embodiments, the non-animal protein is present in the food product in a total amount of from 10% to 25% by weight of the food product.

Plant protein is a source of protein which is obtained or derived from plants. The plant protein may be any suitable plant protein and may comprise a mixture of plant proteins and/or may include protein isolates or concentrates. Examples of suitable plant proteins include those discussed above. As discussed above, preferably, the plant protein comprises textured vegetable proteins (TVP). TVPs are extruded proteins, which may be either dry or moist (i.e. hydrated). TVP is widely available and may be made from plant sources as mentioned above, such as soy flour or concentrate. In dry form, TVP can comprise up to about 70 wt.% of protein, typically about 60 to 70 wt.% of protein, and when hydrated comprises typically about 10 to 20 wt.% of protein. Typically, when hydrated TVPs can contain up to 3 to 4 times their dry weight in water. The weight percentage ranges referred to above for water present in the food products include both water added in its own right and water present in other components of the food product such as in textured vegetable proteins or emulsified with fat. Similarly, the weight percentage ranges given above for the amount of non-animal protein present in the food

product refer to dry weight of protein, and do not include water bound to the non-animal protein such as in textured vegetable protein.

The plant protein used in the preparation of the food product may be either dry (also referred to as 'dry phase' herein) or moist. Thus, in embodiments, the plant protein may be included in a dry mix of ingredients, which may include additional ingredients intended for inclusion in the food product, such as carbohydrates, fibre and/or hydrocolloids, in addition to protein. If the plant protein is dry, it may be hydrated prior to and/or during the formation of the food product. The term 'dry' used in relation to the plant protein and 'dry phase' used herein, is intended to mean that the phase comprising plant protein comprises less than 5 wt.% water, preferably less than 2 wt.% water, more preferably less than 1 wt.% water, even more preferably that it is substantially free from water. In other preferred embodiments, the a_w of the dry phase is 0.90 or lower, more preferably below 0.80. The dry phase comprising plant protein is typically provided in a substantially dehydrated state to reduce microbial growth as far as possible so as to extend shelf life.

The food product typically comprises one or more additional ingredients. Whilst these one or more additional ingredients may be preferable to include in the food products, it will be understood that the inclusion of the one or more additional ingredients is not essential.

In some embodiments, the food product may comprise a stabilizer blend. Preferably, the stabilizer blend is present in the meat analogue or meat product in an amount of from 5% to 10% by weight of the meat analogue or meat product. Typically, the stabilizer blend comprises vegetable derived protein, vegetable fibre and/or a polysaccharide. Preferably, the vegetable derived protein comprises pea protein, the vegetable fibre comprises pea fibre, and/or the polysaccharide comprises methylcellulose. In highly preferred embodiments, the stabiliser blend comprises vegetable derived protein comprising pea protein, vegetable fibre comprising pea fibre, and polysaccharide comprising methylcellulose. It is preferred that the food product comprises a stabilizer blend when the food product is a burger.

Typically, the meat analogue or meat food product further comprises one or more polysaccharides. Preferably, the one or more polysaccharides comprise cellulose, one or more starches, or any derivative or combination thereof.

Typically, the one or more polysaccharides are present in the food product in a total amount of from 1% to 10% by weight of the food product.

Preferably, the food product comprises methylcellulose and one or more starches in a total amount of from 1% to 10% by weight of the food product.

Preferably, the one or more polysaccharides comprise methylcellulose and potato starch.

Preferably, the food product further comprises one or more fibers. More preferably, the one or more fibers comprise non-animal water insoluble fibers. Preferably, the non-animal water insoluble fibers comprise vegetable fibers, fruit fibers, plant fibers, or any combination thereof. More preferably, the non-animal water insoluble fibers comprise citrus fibers, peas fibers such as yellow or green peas fibers potato fibers, bamboo fibers, oat fibers, wheat fibers, cellulose fibers, and any combination thereof. Most preferably, the non-animal water insoluble fibers comprise citrus fibers.

Preferably, the one or more fibers and fat are intermixed in the food product.

Preferably, the food product comprises one or more fibers in a total amount of from 1% to 10% by weight of the food product; and more preferably the food product comprises citrus fibers in an amount of from 1% to 10% by weight of the food product.

Preferably, the food product is a sausage analogue product or sausage food product. More preferably, the meat analogue food product is a sausage analogue food product. In these embodiments, the sausage analogue food product preferably comprises one or more fibers and one or more polysaccharides as discussed above. More preferably, the sausage analogue food product comprises one or more fibers and one or more polysaccharides selected from methylcellulose, one or more starches, and one or more gums. Most preferably, the sausage analogue product comprises citrus fibers, methylcellulose, potato starch and carrageenan. The sausage analogue product preferably also comprises one or more plant derived proteins, or a concentrate or isolate thereof, and more preferably pea protein or a concentrate or isolate thereof.

The meat analogue food product or meat food product may comprise one or more flavouring additives. Preferably, the one or more flavouring additives are present in an amount of from 0.5% to 2% by weight of the food product. Suitable flavouring additives known in the art may be used in the food products.

The food product may comprise one or more colouring additives. Typically, the one or more colouring additives are present in an amount of from 0.5% to 5% by weight of the food product. Suitable colouring additives known in the art may be used in the food products.

In some embodiments, the food product further comprises one or more of: i) polysaccharides and/or modified polysaccharides, preferably selected from methylcellulose, hydroxypropyl methylcellulose, carboxymethyl cellulose, maltodextrin, carrageenan and salts thereof, alginic acid and salts thereof, agar, agarose, agarpectin, pectin and alginate; ii) hydrocolloids; and iii) gums, preferably selected from xanthan gum, guar gum, locust bean gum, gellan gum, gum arabic, vegetable gum, tara gum, tragacanth gum, konjac gum, fenugreek gum, and gum karaya.

Examples of other additives that may be included in the food products include an ionic or non-ionic emulsifier, a polyhydroxy compound, milk, liquid flavours, alcohols, humectants, honey, liquid preservatives, liquid sweeteners, liquid oxidising agents, liquid reducing agents, liquid anti-oxidants, liquid acidity regulators, liquid enzymes, milk powder, hydrolysed protein isolates (peptides), amino acids, yeast, sugar substitutes, starch, salt, spices, fibre, flavour components, colourants, thickening and gelling agents, egg powder, enzymes, gluten, vitamins, preservatives, sweeteners, oxidising agents, reducing agents, anti-oxidants, acidity regulators, or combinations thereof.

Amino acids are a preferred additive for the meat-analogue or meat food products of the invention, since these are known to contribute to the Maillard reaction, a form of non-enzymatic browning resulting from the chemical reaction between amino acids and sugars upon heating. This is used in flavour development of cooked foods and this reaction can be used in the meat-analogue composition to replicate the taste of meat by creating savoury meaty flavours.

Other food products

As discussed above, food products of the invention may also be other types of food products.

The food product of the invention may be a confectionary food product, a chocolate food product, or a chocolate-like food product, all comprising an emulsion as described above. Preferably, in these instances, the food product is formed from one or more of cocoa solids, fats such as cocoa butter, sugar, milk powder, condensed milk, milk, water, or one or more additional ingredients. It will be appreciated that the food product in these instances may comprise any suitable additional ingredient known in the art for inclusion in confectionary, chocolate, and chocolate-like food products. It will also be apparent to the skilled person given the benefit of the present disclosure which respective amounts of the

above-mentioned ingredients are to be used in different types of confectionary and chocolate products.

The food product of the invention may also be a bakery food product such as a cake, bread, pastry, croissant, or other type of bakery product. Emulsions of fat and water are often included in such food products either in the doughs themselves (for example margarine) or in fillings of the products such as cake or pastry fillings. The bakery food products are typically formed from one or more of flour, water, salt, sugar, yeast, eggs or a combination thereof. It will be apparent to the skilled person given the benefit of the present disclosure which respective amounts of the above-mentioned ingredients are to be used in different types of bakery products. Other additional bakery ingredients and additives may also be used in bakery food products of the invention.

The food product of the invention may also be a salad dressing food product comprising an emulsion as described above. In these instances, typically, the one or more oils are present in the food product in a total amount of from 10% to 60% by weight of the total amount of water and oil present in the food product; and the water is present in the food product in an amount of from 40% to 90% by weight of the total amount of water and oil present in the food product. The salad dressing food products typically comprise one or more additional components such as one or more vinegars, one or more mustards, or one or more flavouring additives, or a combination thereof. Herbs, salt, pepper and other flavours may also be included in the salad dressing food products as well as other typical salad dressing ingredients known in the art. These additional components may, in some instances, be part of the emulsions present in the food products.

The food product of the invention may also be a mayonnaise food product. Typically, in these food products, the one or more oils are present in the food product in a total amount of from 50% to 70% by weight of the total amount of water and oil present in the food product; and the water is present in the food product in an amount of from 30% to 50% by weight of the total amount of water and oil present in the food product. Preferably, for mayonnaise food products, the food product is or comprises a water-in-oil emulsion. The mayonnaise food products may comprise other components known in the art for inclusion in these food products such as egg or non-animal protein.

Food products of the invention typically comprise from 40% to 90% by weight of a combined weight of water and one or more oils present in the form of an emulsion.

Where the food product is a meat analogue food product, the food product typically comprises from 45% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion. Different types of meat analogue product will be formed from different amounts of oil and water in the form of an emulsion. For example, typically:

- (i) where the food product is a frankfurter analogue product, the food product comprises from 70% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;
- (ii) where the food product is a bologna analogue product, the food product comprises from 65% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;
- (iii) where the food product is a mortadella analogue product, the food product comprises from 65% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;
- (iv) where the food product is a pepperoni analogue product, the food product comprises from 40% to 60% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;
- (v) where the food product is a salami analogue product, the food product comprises from 45% to 65% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;
- (vi) where the food product is a pate analogue product, the food product comprises from 70% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion; or
- (vii) where the food product is a meat loaf analogue product, the food product comprises from 45% to 60% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

Where the food product is a salad dressing food product, the food product typically comprises from 45% to 90% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

Where the food product comprises, for example, less than 100% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion, the food product may comprise water and oil that are not part of the emulsion. For example, in the case of meat analogue hamburger products or types of sausage such as salami, it may be desired that some fat is present in the form of an emulsion and other fat is present not in the form of an emulsion such as where a marbled appearance of the food product is desired where large macroscopically visible chunks of fat are present on a surface of the meat analogue product. In such cases, the visible chunks of fat are typically not present in the form of an emulsion. Such a marbling type effect may be desired to mimic the appearance and texture of real meat products. Similarly, where a food product such as a meat analogue product comprises water, some water may be present in the form of an emulsion and other water (for example water that is bound to protein) may not be present in the form of an emulsion.

In some embodiments, where the food product is a meat analogue product, the product may comprise 100% by weight of an emulsion. Such products are known as meat emulsion food products where water and water soluble proteins form the continuous phase of the emulsion along with salts and other soluble components. The continuous phase forms a gelled stable protein matrix that entraps water. The dispersed phase of the emulsion is fat which is entrapped by the gelled continuous phase. Water insoluble components such as hydrophobic proteins may also be present in the dispersed fat phase.

Accordingly, preferably, the meat emulsion comprises a continuous phase of water and gelled, dissolved proteins; and a dispersed phase of fat and optionally water insoluble proteins.

Where the meat analogue product is a sausage, it is particularly preferred that the food product is a meat emulsion product. As discussed in further detail below, it has been found that the use of karitene imparts particular advantages to such food products and advantages in processes for their manufacture.

The properties of the food products of the invention may be measured by any suitable means. Properties of interest may include juiciness (and/or dryness), hardness, adhesiveness, springiness, cohesiveness, gumminess, chewiness and resilience. Such means include taste testers, which can provide feedback on properties of food product such as juiciness (or dryness), texture, chewiness and hardness. Typically multiple testers will be asked to mark one or more properties of the food product, such as on a scale from

1 to 5. If multiple testers are asked, an average of the results can be taken to observe the general impression of the food product.

Properties of the food product may also be measured using specialised equipment. For example, texture profile analysis (TPA) is a technique used to characterize textural attributes of solid and semisolid materials and may be used to determine the hardness, adhesiveness, springiness, cohesiveness, gumminess, chewiness and resilience. Gumminess is defined as the product of hardness x cohesiveness. Chewiness is defined as the product of gumminess x springiness (hardness x cohesiveness x springiness). In this technique, the test material may be compressed two times in a reciprocating motion, mimicking the chewing movement in the mouth, producing a Force versus Time (and/or distance) graph, from which the above information can be obtained. TPA and the classification of textural characteristics is described further in Bourne M. C., *Food Technol.*, 1978, 32 (7), 62-66 and Trinh T. and Glasgow S., 'On the texture profile analysis test', Conference Paper, Conference: Chemeca 2012, Wellington, New Zealand, and may be performed as described therein.

The Force versus Time (and/or distance) graph typically includes two peaks in force, corresponding to the two compressions, separated by a trough. Force may be measured in gravitational force equivalent (g-force, g) or Newtons (N).

Hardness (g or N) is defined as the maximum peak force experienced during the first compression cycle.

Adhesiveness is defined as the negative force area for the first bite, i.e. the area of the graph between the two peaks in force which is at or below a force of 0 g or N. This represents the work required to overcome the attractive forces between the surface of a food and the surface of other materials with which the food comes into contact, i.e. the total force necessary to pull the compression plunger away from the sample. For materials with a high adhesiveness and low cohesiveness, when tested, part of the sample is likely to adhere to the probe on the upward stroke. Lifting of the sample from the base of the testing platform should, if possible, be avoided as the weight of the sample on the probe would become part of the adhesiveness value. In certain cases, gluing of the sample to the base of a disposable platform has been advised but is not applicable for all samples.

Springiness, also known as elasticity, is related to the height that the food recovers during the time that elapses between the end of a first compression and the start of a second compression. During the first compression, the time from the beginning of the compression

at force = 0 g or N to the first peak in force is measured (referred to as 'Cycle 1 Duration'). During the second cycle, the time from the beginning of the second compression at force = 0 g or N to the second peak in force is measured (referred to as 'Cycle 2 Duration'). Springiness is calculated as the ratio of these values, i.e. 'Cycle 2 Duration' / 'Cycle 1 Duration'.

Cohesiveness is defined as the ratio of the positive force area, i.e. the area under the curve above a force of 0 g or N, during the second compression to that during the first compression. Cohesiveness may be measured as the rate at which the material disintegrates under mechanical action. Tensile strength is a manifestation of cohesiveness. If adhesiveness is low compared with cohesiveness then the probe is likely to remain clean as the product has the ability to hold together. Cohesiveness is usually tested in terms of the secondary parameters brittleness, chewiness and gumminess.

Gumminess is defined as the product of hardness x cohesiveness and is a characteristic of semisolid foods with a low degree of hardness and a high degree of cohesiveness.

Chewiness is defined as the product of gumminess x springiness (which equals hardness x cohesiveness x springiness) and is therefore influenced by the change of any one of these parameters.

Resilience is a measurement of how the sample recovers from deformation both in terms of speed and forces derived. It is taken as the ratio of areas from the first probe reversal point, i.e. the point of maximum force, to the crossing of the x-axis, i.e. at 0 g or N, and the area produced from the first compression cycle between the start of compression and the point of maximum force. In order to obtain a meaningful value of this parameter, a relatively slow test speed should be selected that allows the sample to recover, if the sample possesses this property.

According to a third aspect of the invention, there is provided the use of karitene as an emulsifier.

Surprisingly, it has been found that karitene can improve the stability of an emulsion to phase separation and/or to prevent degradation of the emulsion.

Preferably, the emulsion is as described above in accordance with the first aspect of the invention.

Karitene can be used in any type of emulsion as an emulsifier. For example, karitene could be used in emulsions in cosmetic products, medical products, nutraceutical products and industrial products.

However, preferably, the use comprises using karitene as an emulsifier in food products. Preferably, the food products are as described above in accordance with the second aspect of the invention.

Surprisingly, as well as acting as an emulsifier, it has been found that karitene can improve the organoleptic perception of a food product relative to an analogous food product with lower karitene content. The term analogous food product as used herein is used to refer to an equivalent weight of a food product that is identical to the food product of the invention, with the exception that the analogous food product contains a lower amount of karitene than food products of the invention.

Specifically, the use may comprise using karitene to improve the texture of the food product, the homogeneity of the food product and/or the umami flavour of the food product relative to an analogous food product with lower karitene content. The use may also comprise using karitene to improve the homogeneity of homogenous food products relative to analogous food products with lower karitene content. These desirable and unexpected effects have been found to be imparted to the food products of the invention to an extent greater than other emulsifiers known in the art for use in food products such as meat analogue food products.

In the case of meat analogue food products, the use may comprise using karitene to enhance the meatiness perception, mouth feel, texture and/or umami sensation of the food product relative to an analogous food product with lower karitene content.

The use may also comprise using karitene to increase the homogeneity of the food product relative to comparative meat analogue food products with lower karitene content. This has been found to especially be the case for sausage analogue food products such as meat emulsion sausage analogue food products.

Where the use comprises using karitene in food products produced by extrusion such as sausages and sausage analogue products, karitene has also been found to surprisingly impart advantages to manufacturing processes for making these products. It has surprisingly been found that products comprising karitene have an increased extrusion force when extruded into casings relative to analogous products that do not comprise

karitene or that comprise different emulsifiers. Without being limited by theory, it is believed that the increased extrusion force is linked to the increased homogeneity of such food products. An increased extrusion force means that casings that are to be stuffed with the food product, such as sausage casings can be stuffed more easily, which simplifies and leads to efficiencies in the manufacturing processes.

Accordingly, the use may comprise using karitene to increase the extrusion force of the meat or meat analogue food product relative to a comparative meat or meat analogue food product with lower karitene content.

According to a fourth aspect of the invention, there is provided a process for preparing an emulsion composition according to the first aspect of the invention, wherein the process comprises combining water and one or more oils so as to form the emulsion composition. Optionally, the process comprises mixing such as blending the water and the one or more oils. The process may comprise shearing the combined water and one or more oils so as to form the emulsion composition. Mixers such as high shear mixers may be used for this purpose. Suitable high shear mixers known in the art for forming emulsions may be used and will be apparent to those skilled in the art given the benefit of the present disclosure.

The emulsion may of course be any emulsion as described above in accordance with the first aspect of the invention.

Other processing steps for forming the emulsion composition that can be used will be apparent to the skilled person given the benefit of the present disclosure and may include e.g. appropriate heat treatment, agitation such as sonication or other processing techniques.

The food products of the invention may be produced using any suitable process known in the art. Suitable processes for making each type of food product will be apparent to the skilled person given the benefit of the present disclosure. Preferably, the food products are produced by a process of the invention as described in further detail below.

According to a fifth aspect of the invention, there is provided a process for forming a food product according to the second aspect of the invention, where the process comprises combining water, one or more oils, and one or more additional components so as to form the food product.

Typically, the process comprises:

- (a) combining water with one or more additional components to form an aqueous mixture; and
- (b) combining the aqueous mixture from step (a) with one or more oils so as to form the food product of the invention.

The emulsion of the food product forms as a result of step (b) of combining the aqueous mixture of step (a) with the one or more oils.

The process may comprise mixing the aqueous mixture formed in step (a) and/or mixing the aqueous mixture formed in step (a) with the one or more oils in step (b).

As discussed above in the context of the emulsion composition, the process may comprise blending the mixture formed in step (b) such as by subjecting the mixture formed in step (b) to shear in a suitable high shear mixer known in the art.

The above-described process may be used for any of the food products of the invention. It is particularly preferred that the above-described process is used where the product of the invention is a meat analogue product such as a sausage analogue product.

In other instances, the process may comprise forming the emulsion by combining the water and one or more oils to form the emulsion prior to mixture of the emulsion with one or more additional components to form the final food product. In these instances, the process may comprise blending the water and one or more oils to form the emulsion prior to combining the emulsion with one or more additional components of the food product. For example, the process may comprise subjecting the water and one or more oils to shear in a suitable high shear mixture to form the emulsion prior to combining the emulsion with one or more additional components of the food product.

Where the food product is an extruded food product such as a sausage or sausage analogue, the process may comprise extruding the food product. Typically, the process then further comprises filling casings with extruded food product.

Meat analogue food products may also be produced by processes as described below, as well as other process known in the art for making meat analogue products.

A process suitable for forming a meat analogue product may comprise the following steps:

- (a) providing a mixture of water and non-animal protein;

- (b) combining the mixture from step (a) with one or more oils and optionally one or more additional components to form the meat analogue product.

The emulsion forms as a result of step (b) of combining the mixture from step (a) with the one or more oils and optionally the one or more additional components.

The process may comprise a step of further processing the meat analogue product such as blending (such as shearing) or extruding the product.

The process may comprise cooking the food product to form a cooked food product or partially cooked food product.

Preferably, the process further comprises blending (i) the mixture of water and non-animal protein provided in step (a); (ii) a mixture formed in step (b) by combining the mixture from step (a) with oil and optionally one or more additional components; and/or (iii) blending the one or more additional components with water prior to combination of the one or more additional components with the mixture from step (a) and one or more oils. Where blending is carried out, typically, the blending is carried out in a suitable high shear mixer known in the art.

In some embodiments, the one or more oils are not melted prior to combining with the mixture from step (a) and optionally one or more additional components. Alternatively, the one or more oils can be melted prior to the combining.

In some instances, the emulsion is formed in step (b) on simply combining and mixing the mixture from step (a) with the one or more oils and optionally one or more additional components to form the meat analogue product. In these instances, no blending or application of shear to the mixture is required. In other instances, the process comprises blending the mixture formed in step (b) such as blending the mixture formed in step (b) in a high shear mixer, such as a suitable high shear mixer known in the art.

The food product of the present invention may be readily prepared by blending an oil as described herein with plant protein and any other components. In one embodiment, there is provided a process for preparing a food product, said process comprising the step of: forming the food product by blending a plant protein with an oil as described herein. Optionally, further ingredients may be present. Water may be added to the mixture if required at any stage during the process. The process may further comprise the step of preparing the plant protein by providing a dry phase comprising plant protein and blending

the dry phase with an amount of water, which precedes the step of forming the food product. This step may also include other ingredients which are in dry form, such that these dry ingredients are hydrated simultaneously with the plant protein. Additionally and/or alternatively, any other dry ingredients may be hydrated separately from the plant protein in any combination. In embodiments which include TVPs, the TVP is preferably hydrated separately from any other dry ingredients. Without being bound by theory, this is believed to limit competition between the dry components for the water and ensure satisfactory hydration for all dry components present.

Thus, disclosed herein is a process for preparing a food product, said process comprising the steps of: **a)** providing a dry phase comprising plant protein and optionally any other dry ingredients of the composition and blending the dry phase with an amount of water to form a mixture; **b)** forming the food product by blending the mixture formed in step **a)** with an oil as described herein. In embodiments, the plant protein may comprise TVPs. Preferably, dry ingredients other than the plant protein are hydrated separately from the plant protein. Examples of such dry ingredients include, but are not limited to, fibres, flavours, emulsifiers, gums, hydrocolloids, thickeners. In embodiments, the mixture of step **a)** comprising the hydrated plant protein and any other mixtures comprising hydrated dry ingredients are combined prior to step **b)**. Without being bound by theory, it is believed that the hydration of dry ingredients prior to the addition of the fat (for example, in step **a)**) results in an optimal distribution of water in the product, resulting in a more stable meat-analogue product.

The dry phase comprising plant protein used in the above process is not particularly limited. The plant protein is as described hereinabove. The term 'dry phase' is intended to mean that the phase comprising plant protein comprises less than 5 wt.% water, preferably less than 2 wt.% water, more preferably less than 1 wt.% water, even more preferably that it is substantially free from water. In other preferred embodiments, the a_w of the dry phase is 0.90 or lower, more preferably below 0.80. The dry phase comprising plant protein is typically provided in a substantially dehydrated state to reduce microbial growth as far as possible so as to extend shelf life.

The dry phase, which may comprise plant protein, may take any physical form before being blended with water, however typically it is in powder, granule or pelletized, strip or chunk form. The amount of water added to the dry phase is not particularly limited.

Typically, an amount of water is added in order to bind the dry components into a paste or dough with which the fat may be readily blended. The amount of water added to the dry phase is preferably calculated such that the total amount of water in the food product after addition of the other components of the fat are within the ranges described above.

The temperature of the water added is not particularly limited, so long as it does not materially impact the intended characteristics of the components (e.g. does not lead to protein denaturation or hydrolysis). In preferred embodiments, the water is below room temperature (i.e. below 20 °C). In particularly preferred embodiments, ice water is used. This is particularly preferred when water is added to the dry phase. The term "ice water" is defined herein as having a temperature of above 0°C and below 6°C, preferably from 0.5 to 5 °C, more preferably from 1 to 4 °C, more preferably from 1 to 3 °C. An advantage of using ice water is that it slows microbial growth as far as possible during preparation of the food product and it is particularly suitable for the hydration of certain dry ingredients as methylcellulose.

The blending of the dry phase with water may be performed for any duration of time. In embodiments, blending is performed until the dry phase and water are intimately mixed and typically until a paste or dough is formed. In embodiments in which TVPs are hydrated, blending is limited to a minimum so as not to overly disturb the fibrous structures. In embodiments this may be performed for a duration of from 1 minute to 30 minutes, preferably from 1 minutes to 10 minutes, more preferably from 5 seconds to 5 minutes.

Following blending of the dry phase and water, for example in step **a)**, the mixture may be allowed to rest prior to the addition of the oil, for example in step **b)**. This may ensure full hydration of the dry phase prior to addition of the oil. This rest may be performed under cold storage (thereby further controlling microbial growth), which has a temperature of from 0.5 to 15 °C, preferably from 1 to 12 °C, more preferably from 5 to 10 °C. This rest may be performed for a duration of from 5 minutes to 5 hours, preferably from 5 minutes to 2 hours, more preferably from 5 minutes to 30 minutes.

Preparation of the food product may also comprise the step of adding further ingredients to the product. These ingredients may be added at any stage in the preparation of the food product. In embodiments, further ingredients are added after the addition of the fat, for example after step **b)**. Preferably, dry ingredients are hydrated prior to addition to the fat.

In embodiments, dry ingredients are hydrated with any dry plant protein, such as in step a), prior to the addition of the fat. Such ingredients may include one or more of carbohydrates, polysaccharides, modified polysaccharides, hydrocolloids, gums, milk, liquid flavours, alcohols, humectants, honey, liquid preservatives, liquid sweeteners, liquid oxidising agents, liquid reducing agents, liquid anti-oxidants, liquid acidity regulators, liquid enzymes, milk powder, hydrolysed protein isolates (peptides), amino acids, yeast, sugar substitutes, starch, salt, spices, fibre, flavour components, colourants, thickening and gelling agents, egg powder, enzymes, gluten, vitamins, preservatives, sweeteners, oxidising agents, reducing agents, anti-oxidants, and acidity regulators, as disclosed in more detail herein. The addition of these ingredients may be performed by blending, mixing or any suitable means.

Once the food product has been prepared, this may be further processed. This may include the step of forming the food product into the desired shape. The shape and size of the resulting food product is not particularly limited. Examples of shaped food products which can be made include burgers, sausages, nuggets, meatballs and mince.

Any suitable method may be used to shape the food product into the desired shape. In embodiments, this may be performed by cutting, moulding, pressing, extrusion, rolling, grinding or any combination thereof. These processes may be performed using an apparatus, which may be operated manually or may be automated. In embodiments, the meat-analogue product may be compressed for 5 minutes to 24 hours, preferably 1 hour to 12 hours, more preferably 3 hours to 8 hours. The duration and pressure of compression is determined by the desired properties of the resulting food product, such as its size and density, taking into account the properties of the food product, such as adhesiveness, among other factors. This may form the desired shape of the food product, or it may be further processed such as by pelletizing, grinding or cutting, for instance to replicate the attributes of ground/minced meat.

The process of preparing a food product may further comprise cooking or part-cooking the food product. Cooking may comprise boiling, baking, frying and/or microwaving. In preferred embodiments, cooking is at sufficient temperature such that the Maillard reaction may occur (for example, above 80 °C and up to 180 °C, preferably from 130 °C to 170 °C). The Maillard reaction is useful for desirable browning of the food product.

DESCRIPTION OF THE DRAWINGS

Figures 1 to 4 show emulsions of the invention at different concentrations of oil and water compared to comparative emulsions.

Figure 5 shows a graph of extrusion force during extrusion for a meat analogue product of the invention compared to a comparative food product.

Figure 6 shows a graph of firmness for a cooked meat analogue product of the invention compared to a cooked comparative food product.

Figures 7 shows the results of a texture profile analysis test performed by a panel on a cooked meat analogue product of the invention and a cooked comparative meat analogue product.

Figure 8 shows a preference test performed by a panel on a cooked meat analogue product of the invention and a cooked comparative meat analogue product.

DETAILED DESCRIPTION OF THE INVENTION

The following examples are for illustrative purposes only and are not intended to limit the scope of the invention in any way.

Example 1

The following emulsions as shown in Table 1 were prepared. For invention compositions 1 to 4, the oil used was shea olein comprising 3 wt.% karitene. For comparative compositions 1 to 4, shea olein processed to remove karitene was used.

Table 1

	Type of emulsion	Shea Olein (weight percentage)	Water (weight percentage)
Invention composition 1	Oil in water (O/W)	20	80
Invention composition 2	Oil in water (O/W)	40	60
Invention composition 3	Oil in water (O/W)	65	35
Invention composition 4	Water in oil (W/O)	80	20

Comparative composition 1	Oil in water (O/W)	20	80
Comparative composition 2	Oil in water (O/W)	40	60
Comparative composition 3	Oil in water (O/W)	65	35
Comparative composition 4	Water in oil (W/O)	80	20

For the preparation of all emulsions, water was heated to 30°C. For invention and comparative compositions 1 to 3, oil was then added to the water slowly whilst mixing the mixture with an Ultra-turrax homogenizer. For invention and comparative composition 4, water was added to the oil whilst mixing the mixture with an Ultra-turrax homogenizer.

For each composition, the following homogenizer conditions were used.

Invention and comparative composition 1: 7 minutes at 7000 rpm and 3 minutes at 9000 rpm.

Invention and comparative compositions 2 and 3: An initial mixing speed of 5000 rpm followed by increasing to 10,000 rpm. After full addition of the oil, 12,000 rpm for two minutes was used. A total mixing time of around 15 minutes was used.

Invention and comparative composition 4: An initial mixing speed of 6000 rpm was used for two minutes followed by an increase to 7000 rpm. All water was added after 5 minutes. Mixing was then continued at 9000 rpm for 1 minute.

Photographs taken of the emulsions after production are shown in Figures 1 to 4 respectively for Invention and comparative compositions 1 to 4.

As shown in Figure 1, right after preparation, comparative composition 1 (on the right hand side of Figure 1) was homogenous, but showed clear phase separation in a few minutes, indicating separation of the emulsion. Invention composition 1 (on the left hand side of Figure 1) on the other hand showed only very minimal phase separation and was a stable emulsion.

As shown in Figure 2, comparative composition 2 (on the left hand side of Figure 2) immediately demonstrated phase separation. In contrast, invention composition 2 (on the right hand side of Figure 2) remained as a white, creamy liquid.

As shown in Figure 3, comparative composition 3 (on the right-hand side of Figure 3) immediately demonstrated phase separation. In contrast, invention composition 3 (on the left hand side of Figure 3) remained as a white, creamy liquid.

As shown in Figure 4, after preparation, invention composition 4 (shown on the left-hand side of Figure 4) showed more resistance to phase separation than comparative composition 4 (shown on the right-hand side of Figure 4).

The results of these experiments thus demonstrate that where karitene is included in the emulsions, the karitene acts as an emulsifier and stabilises the emulsions to failure via phase separation.

Example 2

Using shea olein comprising 3 wt.% karitene, a sausage analogue food product was prepared. The composition of the sausage analogue food product is as shown below in Table 2. The food product was a smoked food product. The final food product once prepared comprised 100% by weight of a meat emulsion product as described above.

Table 2

Ingredient	Weight percentage
Water	66.67
Shea olein	16.92
Pea protein isolate	7.39
Carrageenan (kappa)	2.29
Potato starch	1.94
Methylcellulose	1.83
Salt	1.60

Citrus Fibre	1.38
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The sausage analogue product was prepared using the following procedure.

1. Iced water was added into a bowl chopper and methylcellulose added thereto whilst blending. Once the mixture was homogenous, it was allowed to rest for 5 minutes.
2. The remaining dry ingredients were then added and mixed at a low speed until the mixture came together evenly. The mixture was maintained at as low a temperature as possible.
3. The shea olein was then added to the mixture whilst mixing so as to form an emulsion.
4. The mixture was then filled into sausage casings and transferred to a smoker for smoking.

In the process described above, the shea olein is a semi liquid fat and so melting prior to incorporation is not required.

The process was repeated again to form a comparative sausage analogue product. The comparative product was the same as the sausage analogue product of the invention with the exception that the product comprised 16.67% rapeseed oil instead of the shea olein with 3 wt. % karitene. Rapeseed oil is an oil that also exhibits an emulsifier effect (believed to be due to the presence of mono-and diglycerides present in the oil which are emulsifiers).

It was found that the sausage analogue product of the invention had improved stability and homogeneity of the meat emulsion product relative to the comparative product. This demonstrates that the karitene present in the shea is in fact a better emulsifier than the rapeseed oil.

Both the product of the invention and the comparative product were extruded and stuffed into casings. The extrusion force during extrusion for both products is shown in Figure 5. It can be seen that the product of the invention generated a higher extrusion force when extruded than the comparative product. The higher extrusion force generated by the product of the invention means that the sausage casings are easier to stuff and that there is desirably less absorption into the food product during the mixing and stuffing process.

The higher extrusion force generated by the product of the invention is believed to be linked to the greater homogeneity of the meat emulsion product which is believed to be linked to the greater emulsification properties of the karitene present in the shea relative to rapeseed oil.

After the sausages of the invention and the comparative sausages were smoked, the firmness of the two food products were tested and compared. The results of this are shown in Figure 6. It can be seen in the figure that sausages of the invention have a greater firmness than the comparative sausages. This is desirable since it means that the sausages of the invention more closely resemble the firmness of a pork hot dog and provide an organoleptic profile more similar to that of pork sausages. The skin of the sausages of the invention were also unexpectedly easier to peel away than the skin of the comparative sausage product demonstrating that the meat analogue food products of the invention also have a desirable reduced adhesiveness associated therewith.

The sausages were then fried after smoking and tested by a panel for texture profile analysis. The panel comprised seventeen different testers. Hardness, gumminess and chewiness of the sausages were analysed. The result of the experiment are shown in Figure 7. As can be seen in the figure, the sausages of the invention exhibited higher hardness, gumminess and chewiness than the comparative sausages. This is desirable since a higher score for these properties means that the food product more closely mimics the organoleptic properties of pork sausages. The panel then assessed the two sausages for preference. The results of this experiment are shown in Figure 8. It can be seen in the figure that the product of the invention was strongly preferred by the panel than the comparative product demonstrated the more desirable organoleptic properties of the product of the invention.

Example 3

Using shea olein comprising 3 wt.% karitene, a pate analogue food product was prepared. The composition of the pate analogue food product is as shown below in Table 3. The final food product once prepared comprised 100% by weight of a meat analogue emulsion product as described above.

Table 3

Ingredient	Weight percentage
Water	64.4
Shea olein	10.0
Sunflower protein	18.0
White wine vinegar	2.0
Carrageenan (kappa)	0.6
Potato starch	2.0
Flavourings	0.85
Salt	1.8
Colourings	0.45

The pate analogue product was prepared using the following procedure.

1. All dry ingredients, except the flavourings and colourings, were weighed out and mixed thoroughly.
2. The water and white wine vinegar were then weighed out and added to the dry ingredients whilst mixing, and mixed until the mixture was homogeneous.
3. The shea olein was then added to the mixture whilst mixing so as to form an emulsion (over a period of about 10 minutes).
4. The flavourings and colourings were then added to the emulsion whilst mixing.
5. The final product was then heated to 85°C for about 20 seconds and then placed into piping bags for producing the pate samples.

In the process described above, the shea olein is a semi liquid fat and so once again melting prior to incorporation is not required.

The process was repeated again to form a comparative pate analogue product. The comparative product was the same as the pate analogue product of the invention with the exception that the product comprised rapeseed oil instead of the shea olein with 3 wt. % karitene. As noted above, rapeseed oil also exhibits an emulsifier effect (believed to be due to the presence of mono-and diglycerides present in the oil which are emulsifiers).

The pates were tested by a panel for texture and taste analysis. The panel comprised twenty-four different testers. Mouthfeel and flavour of the pates were analysed. The result of the experiment were clear in the preference for the pate of the invention over that of the comparative pate. With respect to mouthfeel, 17 of the testers preferred the pate of the invention. This is of course desirable since a higher score indicates that the food product more closely mimics the organoleptic properties of a meat pate. For flavour, 15 of the testers preferred the pate of the invention. The results of this experiment again strongly demonstrate the more desirable organoleptic properties of the product of the invention.

CLAIMS

1. An emulsion composition comprising one or more oils and water; wherein the emulsion composition comprises from 0.1% to 7.5% of karitene by total weight of water and the one or more oils present in the emulsion composition; and wherein the emulsion composition comprises at least 1.0% of karitene by weight of the total amount of the one or more oils present in the emulsion composition.
2. An emulsion composition according to Claim 1, wherein the emulsion composition comprises karitene in an amount of from 1.0% to 10.0%; preferably from 1.5% to 7.5% (including 2.0% to 6.0%); and more preferably from 2.0% to 5.0% (including 3.0% to 5.0% and 4.0% to 5.0%) by weight of the total amount of the one or more oils present in the emulsion composition.
3. An emulsion composition according to any preceding claim, wherein the emulsion composition comprises karitene in an amount of from 0.1% to 5% by total weight of water and the one or more oils present in the emulsion composition; preferably wherein the emulsion composition comprises karitene in an amount of from 0.5% to 5% (such as 1.5% to 3.5%) by total weight of water and the one or more oils present in the emulsion composition.
4. An emulsion composition according to any preceding claim, wherein the one or more oils are present in the emulsion composition in a total amount of from 1% to 99% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 1% to 99% by weight of the total amount of water and oil present in the emulsion composition; preferably wherein the one or more oils are present in the emulsion composition in a total amount of from 10% to 90% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 10% to 90% by weight of the total amount of water and oil present in the emulsion composition; more preferably wherein the one or more oils are present in the emulsion composition in a total amount of from 15% to 90% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 10% to 85% by weight of the total amount of water and oil present in the emulsion composition.
5. An emulsion composition according to any preceding claim, wherein the one or more oils are present in the emulsion composition in a total amount of from 50% to 99%

by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 1% to 50% by weight of the total amount of water and oil present in the emulsion composition; preferably wherein the one or more oils are present in the emulsion composition in a total amount of from 70% to 99% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 1% to 30% by weight of the total amount of water and oil present in the emulsion composition.

6. An emulsion composition according to Claim 5, wherein the emulsion composition is a water-in-oil emulsion.

7. An emulsion composition according to any of Claims 1 to 4, wherein the one or more oils are present in the emulsion composition in a total amount of from 1% to 70% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 30% to 99% by weight of the total amount of water and oil present in the emulsion composition; preferably wherein the one or more oils are present in the emulsion composition in a total amount of from 1% to 60% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 40% to 99% by weight of the total amount of water and oil present in the emulsion composition.

8. An emulsion composition according to any of Claims 1 to 4, wherein the one or more oils are present in the emulsion composition in a total amount of from 1% to 45% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 55% to 99% by weight of the total amount of water and oil present in the emulsion composition; preferably wherein the one or more oils are present in the emulsion composition in a total amount of from 5% to 30% by weight of the total amount of water and oil present in the emulsion composition; and wherein the water is present in the emulsion composition in an amount of from 70% to 95% by weight of the total amount of water and oil present in the emulsion composition.

9. An emulsion composition according to Claim 7 or Claim 8, wherein the emulsion composition is an oil-in-water emulsion composition.

10. An emulsion composition according to any preceding claim, wherein the one or more oils comprise one or more plant-derived triglyceride oils, one or more animal-derived triglyceride oils, or a combination thereof.
11. An emulsion composition according to any preceding claim, wherein the one or more oils comprise one or more plant-derived triglyceride oils.
12. An emulsion composition according to any preceding claim, wherein the one or more oils comprise high oleic sunflower oil, sunflower oil, rapeseed oil, high oleic rapeseed oil, soybean oil, linseed oil, olive oil, corn oil, cottonseed oil, groundnut oil, safflower oil, high oleic safflower oil, peanut oil, rice oil, camelina oil, sesame oil, walnut oil, palm fat, coconut fat, shea butter, cocoa butter, allanblackia fat, kokum fat, mango kernel fat, sal fat, illipe butter, palm kernel fat, babassu fat, any fractions thereof, any interesterified forms thereof, or any combinations thereof.
13. An emulsion composition according to any preceding claim, wherein the one or more oils comprise palm fat, coconut fat, shea butter, cocoa butter, allanblackia fat, kokum fat, mango kernel fat, sal fat, illipe butter, palm kernel fat, babassu fat, any fractions thereof, any interesterified forms thereof, or any combinations thereof.
14. An emulsion composition according to any preceding claim, wherein the one or more oils comprise shea butter, any fractions thereof, any interesterified forms thereof, or any combinations thereof.
15. An emulsion composition according to any preceding claim, wherein the one or more oils comprise shea olein.
16. An emulsion composition according to Claim 15, wherein the one or more oils comprise SOS triglycerides in an amount of from 0.1% to 25% by weight; preferably from 0.5% to 15% by weight; and more preferably from 1% to 10% by weight of the total amount of the one or more oils present in the emulsion composition.
17. An emulsion according to any preceding claims, wherein the emulsion composition further comprises one or more additional emulsifiers such as food grade emulsifiers, for example, such emulsifiers include lecithin (such as egg lecithin), mono- and diglycerides, polysorbates and hydrocolloids such as guar gum, gellan gum and carrageenan.
18. A food product comprising an emulsion comprising one or more oils and water; wherein the food product comprises karitene in an amount of from 0.1% to 7.5% by weight

of the food product; and wherein the food product comprises at least 1.0% of karitene by weight of the total amount of the one or more oils present in the food product.

19. A food product according to Claim 18, wherein the food product comprises karitene in an amount of from 0.1% to 5.0% by weight of the food product; preferably wherein the food product comprises karitene in an amount of from 0.2% to 5.0% (such as 1.5% to 3.5%) by weight of the food product; and more preferably wherein the food product comprises karitene in an amount of from 0.2% to 3.0% by weight of the food product.

20. A food product according to Claim 18 or Claim 19, wherein the emulsion is an emulsion composition as defined in any one or more of Claims 1 to 17.

21. A food product according to any one or more of Claims 18 to 20, wherein the food product is a meat analogue food product; a meat food product; a confectionary food product; a chocolate food product; or a chocolate-like food product; a bakery food product; a soup; a mayonnaise; a salad dressing; or a sauce.

22. A food product according to Claim 21, wherein:

(a) the food product is a meat analogue food product or a meat food product; and wherein the emulsion is an emulsion composition according to any of Claims 7 to 9;

(b) the food product is a confectionary food product; a chocolate food product; or a chocolate-like food product; and wherein the emulsion is an emulsion composition according to Claim 5 or Claim 6; or

(c) the food product is a bakery food product; and wherein the emulsion is an emulsion composition according to any of Claims 7 to 9.

23. A food product according to Claim 21 or Claim 22, wherein the food product is a meat food product or a meat analogue food product formed from 2% to 30% by weight of fat; from 30% to 70% by weight of water; and from 2% to 40% by weight of a non-animal protein.

24. A food product according to Claim 23, wherein the food product is a vegetarian or vegan meat substitute food product; preferably wherein the vegetarian or vegan meat substitute food product is a burger, sausage, meat ball, nugget, patty, mince product, meatloaf, frankfurter, bologna, mortadella, pepperoni, salami, pate, meat loaf, or other product intended to mimic conventional meat-based food products.

25. A food product according to Claim 23 or Claim 24, wherein the food product is an uncooked food product, a cooked food product, or a partially cooked food product.
26. A food product according to any of Claims 23 to 25, wherein the non-animal protein comprises protein derived from fungi or plants, fermentation derived protein, or a combination thereof.
27. A food product according to any of Claims 23 to 26, wherein the non-animal protein comprises plant protein, preferably, wherein the plant protein is selected from algae protein, black bean protein, canola wheat protein, chickpea protein, fava protein, lentil protein, lupin bean protein, mung bean protein, oat protein, pea protein, potato protein, rice protein, soy protein, sunflower seed protein, wheat protein, white bean protein, seitan, rice protein, mushroom protein, legume protein, tempeh, yam flour, tofu, mycoprotein, peanut flour, yuba, protein isolates or concentrates thereof, or any combination thereof.
28. A food product according to any of Claims 23 to 27, wherein the non-animal protein comprises pea protein isolate.
29. A food product according to any of Claims 23 to 28, wherein the food product further comprises one or more polysaccharides; preferably wherein the one or more polysaccharides comprise cellulose, one or more starches, or any derivative or combination thereof.
30. A food product according to Claim 29, wherein the one or more polysaccharides are present in the food product in a total amount of from 1% to 10% by weight of the food product; preferably wherein the food product comprises methylcellulose and one or more starches in a total amount of from 1% to 10% by weight of the food product.
31. A food product according to Claim 29 or Claim 30, wherein the one or more polysaccharides comprise methylcellulose and potato starch.
32. A food product according to any of Claims 23 to 31, wherein the food product further comprises one or more fibers; preferably wherein the one or more fibers comprise non-animal water insoluble fibers.
33. A food product according to Claim 32, wherein the non-animal water insoluble

fibers comprise vegetable fibers, fruit fibers, plant fibers, or any combination thereof; preferably wherein the non-animal water insoluble fibers comprise citrus fibers, peas fibers such as yellow or green peas fibers potato fibers, bamboo fibers, oat fibers, wheat fibers, cellulose fibers, and any combination thereof; more preferably wherein the non-animal water insoluble fibers comprise citrus fibers.

34. A food product according to Claim 32 or Claim 33, wherein the one or more fibers and fat are intermixed.

35. A food product according to any one or more of Claims 32 to 34, wherein the food product comprises one or more fibers in a total amount of from 1% to 10% by weight of the food product; preferably wherein the food product comprises citrus fibers in an amount of from 1% to 10% by weight of the food product.

36. A food product according to any of Claims 23 to 35, wherein the food product further comprises one or more of: i) polysaccharides and/or modified polysaccharides, preferably selected from methylcellulose, hydroxypropyl methylcellulose, carboxymethyl cellulose, maltodextrin, carrageenan and salts thereof, alginic acid and salts thereof, agar, agarose, agaropectin, pectin and alginate; ii) hydrocolloids; and iii) gums, preferably selected from xanthan gum, guar gum, locust bean gum, gellan gum, gum arabic, vegetable gum, tara gum, tragacanth gum, konjac gum, fenugreek gum, and gum karaya.

37. A food product according to any of Claims 23 to 36, wherein the food product further comprises an ionic or non-ionic emulsifier, a polyhydroxy compound, milk, liquid flavours, alcohols, humectants, honey, liquid preservatives, liquid sweeteners, liquid oxidising agents, liquid reducing agents, liquid anti-oxidants, liquid acidity regulators, liquid enzymes, milk powder, hydrolysed protein isolates (peptides), amino acids, yeast, sugar substitutes, starch, salt, spices, fibre, flavour components, colourants, thickening and gelling agents, egg powder, enzymes, gluten, vitamins, preservatives, sweeteners, oxidising agents, reducing agents, anti-oxidants, and acidity regulators.

38. A food product according to any of Claims 23 to 37, wherein the food product comprises fat in an amount of from 7.5% to 25% by weight of the food product.

39. A food product according to any of Claims 23 to 38, wherein the food product comprises water in an amount of from 50% to 70% by weight of the food product.

40. A food product according to any of Claims 23 to 39, wherein the food product is a sausage analogue food product or a sausage food product; preferably wherein the food product is a sausage analogue food product.

41. A food product according to any one or more of Claims 18 to 22, wherein the food product is a confectionary food product, a chocolate food product, or a chocolate-like food product; preferably wherein the food product further comprises one or more of cocoa solids, cocoa butter, sugar, milk powder, condensed milk, milk, or water.

42. A food product according to any one or more of Claims 18 to 22, wherein the food product is a bakery food product; preferably wherein the food product further comprises one or more of flour, water, salt, sugar, yeast or eggs.

43. A food product according to any one or more of Claims 18 to 21, wherein the food product is a salad dressing food product; wherein the one or more oils are present in the food product in a total amount of from 10% to 60% by weight of the total amount of water and oil present in the food product; and wherein the water is present in the food product in an amount of from 40% to 90% by weight of the total amount of water and oil present in the food product; optionally wherein the food product further comprises one or more additional components such as one or more vinegars, one or more mustards, or one more flavouring additives.

44. A food product according to any one or more of Claims 18 to 21, wherein the food product is a mayonnaise food product; wherein the one or more oils are present in the food product in a total amount of from 50% to 70% by weight of the total amount of water and oil present in the food product; and wherein the water is present in the food product in an amount of from 30% to 50% by weight of the total amount of water and oil present in the food product; optionally wherein the food product further comprises one or more additional components such as egg.

45. A food product according to any one or more of Claims 18 to 44, wherein the food product is substantially free of animal-derived products, preferably, wherein the food products is free of animal-derived products.

46. A food product according to any one or more of Claims 18 to 44, wherein the food product further comprises one or more animal-derived products such as animal oils,

marine oils, animal-derived proteins, animal-derived polysaccharides, or any combination thereof.

47. A food product according to any one or more of Claims 18 to 46, wherein the one or more animal-derived products comprise animal milk proteins, animal milk fats, or a combination thereof.

48. A food product according to Claim 46 or Claim 47, wherein the one or more animal-derived products are present in the food product in an amount of from 1% to 20% by weight of the food product.

49. A food product according to any one or more of Claims 18 to 48, wherein the food product is substantially free of palm oil and palm oil derived products; preferably wherein the food product is free of palm oil or palm oil derived products.

50. A food product according to any one or more of Claims 18 to 49, wherein the food product comprises from 40% to 90% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

51. A food product according to Claim 50, wherein the food product is according to any one or more of Claims 23 to 39, and wherein the food product comprises from 45% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

52. A food product according to Claim 51, wherein:

(i) the food product is a frankfurter analogue product, wherein the food product comprises from 70% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;

(ii) the food product is a bologna analogue product, wherein the food product comprises from 65% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;

(iii) the food product is a mortadella analogue product, wherein the food product comprises from 65% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;

(iv) the food product is a pepperoni analogue product, wherein the food product comprises from 40% to 60% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;

(v) the food product is a salami analogue product, wherein the food product comprises from 45% to 65% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion;

(vi) the food product is a pate analogue product, wherein the food product comprises from 70% to 85% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion; or

(vii) the food product is a meat loaf analogue product, wherein the food product comprises from 45% to 60% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

53. A food product according to Claim 43, wherein the food product comprises from 45% to 90% by weight of a combined weight of water and one or more oils that are present in the form of an emulsion.

54. A food product according to Claim 40, wherein the food product comprises 100% by weight of an emulsion and wherein the emulsion is a meat emulsion.

55. A food product according to Claim 54, wherein the meat emulsion comprises a continuous phase of water and gelled, dissolved proteins; and a dispersed phase of fat and optionally water insoluble proteins.

56. Use of karitene as an emulsifier in an emulsion.

57. Use according to Claim 56, wherein the use comprises using the karitene to improve the stability of the emulsion to phase separation or to prevent degradation of the emulsion.

58. Use according to Claim 56 or Claim 57, wherein the emulsion is as defined in any one or more of Claims 1 to 17.

59. Use according to any one or more of Claims 56 to 58, wherein the use further comprises using the emulsion in a food product according to any one or more of Claims 18 to 55.

60. Use according to Claim 59; wherein the use comprises using the karitene to improve the organoleptic perception of the food product relative to an analogous food product with lower karitene content.
61. Use according to Claim 59 or Claim 60, wherein the use comprises using the karitene to improve the texture of the food product, the homogeneity of the food product and/or the umami flavour of the food product relative to an analogous food product with lower karitene content.
62. Use according to Claim 61, wherein the food product is as defined in any one or more of Claims 23 to 40; and wherein the use comprises using the karitene to enhance the meatiness perception, mouth feel, texture and/or umami sensation of the food product relative to an analogous food product with lower karitene content.
63. Use according to any one or more of Claims 59 to 62, wherein the use comprises using the karitene to increase the homogeneity of the food product relative to a comparative food product with lower karitene content.
64. Use according to any one or more of Claims 59 to 63, wherein the food product is as defined in any one or more of Claims 23 to 40, and wherein the use comprises using the karitene to increase the homogeneity of the food product relative to a comparative meat or meat analogue food product with lower karitene content.
65. Use according to Claim 64, wherein the use comprises using the karitene to increase the extrusion force of the meat or meat analogue food product relative to a comparative meat or meat analogue food product with lower karitene content.
66. A process for preparing an emulsion composition according to any one or more of Claims 1 to 17, wherein the process comprises combining water and one or more oils so as to form the emulsion composition; optionally wherein the process comprises mixing such as blending the water and the one or more oils.
67. A process for preparing a food product according to any one of Claims 18 to 55, wherein the process comprises combining water, one or more oils, and one or more additional components so as to form the food product.
68. A process according to Claim 67, wherein the process comprises:

(a) combining water with one or more additional components to form an aqueous mixture; and

(b) combining the aqueous mixture from step (a) with one or more oils so as to form the food product according to any one of Claims 18 to 55.

69. A process according to Claim 68, wherein the process comprises mixing the aqueous mixture formed in step (a) and/or mixing the aqueous mixture formed in step (a) with the one or more oils in step (b).

70. A process according to any one or more of Claims 68 to 69, wherein the process comprises extruding the food product.

71. A process according to Claim 70, wherein the food product is according to any one or more of Claims 23 to 40; and wherein the process further comprises filling casings with extruded food product.