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(54) Title: A METHOD OF PRODUCING ORGANIC EMULSIFIERS AND ORGANIC SURFACTANTS, PRODUCTS PRODUCED BY SAID METHOD, AND THE USE OF SUCH PRODUCTS

(57) Abstract: The present invention relates to a method of producing organic emulsifiers and organic surfactants and to the organic emulsifiers and organic surfactants produced by said method. This production is possible by using oil or fat from organically produced sources, e.g. organically produced plants or animals, in the preparation of the emulsifiers and surfactants. When the emulsifiers and surfactants of the present invention are used in the production of organic end-products such as organic cosmetics, organic foods, organic pharmaceuticals, organic technicals and organic detergent compositions, these end-products will be fully organic. Examples of organic products according the present invention are organic cosmetics, organic foods, organic pharmaceuticals, organic technicals and organic detergent compositions of superior quality.

A method of producing organic emulsifiers and organic surfactants, products produced by said method, and the use of such products

FIELD OF THE INVENTION

The present invention relates to a method of producing organic emulsifiers and organic surfactants, to organic emulsifiers and organic surfactants produced by said method, and more specifically to organic cosmetic, organic food, organic pharmaceutical, organic technical and organic detergent compositions containing them as well as the use of organic emulsifiers and organic surfactants produced by said method for the preparation of organic cosmetic, organic food, organic pharmaceutical, organic technical and organic detergent preparations of superior quality.

BACKGROUND OF THE INVENTION

Modern agriculture is characterised by the extensive use of synthetic pesticides and chemical fertilisers. Pesticides include herbicides such as 2,4-Dichlorophenoxyacetic acid, 2,4,5-Trichlorophenoxyacetic acid, Alachlor, Amitrole, Atrazine, Metribuzin and Trifluralin; fungicides such as Benomyl, ethylene bis dithiocarbamates, hexachlorobenzene and tributyltin compounds; insecticides such as Cabaryl, Malathion, Methomyl, Dicolfol, Methoxychlor, Lindane, Beta-Hexachlorocyclohexane, DDT, Chlordane, heptachlor and heptachlor epxides, Dieldrin, Mirex, Toxaphene, and nematocides such as Aldicarb and 1,2-Dibromo-3-chloropropane. [1]

A number of pesticides have been found to accumulate in nature. Recently, pesticide residues have been found in drinking water in a number of countries. Furthermore it is well established that a broad spectrum of crops and foods derived therefrom contain considerable amounts of pesticides. Also, potential non-food products such as vegetable oils often contain pesticide residues.

The exposure of humans to pesticides is a problem because many pesticides are a potential health hazard.[1-9]

Therefore, the use of pesticides imposes a risk to people involved in such agricultural production and to people exposed to agricultural products derived therefrom.

Another problem in relation to conventional agriculture is the extensive use of chemical fertilisers, e.g. phosphates and nitrates. It is estimated that a large percentage of the used fertilisers is washed out of the soil and into the general environment. Thus unnatural amounts of such fertilisers can be found in rivers, lakes and coastal sea areas, where they give rise to abnormal growth of water plants and algae giving imbalances in the natural ecosystems. One consequence is depletion of oxygen causing extensive death among fish.

On the basis of the above-mentioned problems associated with conventional agriculture, a new form of agriculture has evolved, termed organic agriculture. This model of agriculture, which is also sometimes called "ecological agriculture" or "biological agriculture", is in practise free of the use of synthetic pesticides or processed chemical fertilisers. Thus organic agriculture is much more environmentally friendly and provides crops that are free of pesticide residues.

Organic agriculture is based on specific and precise standards of production which aim at achieving optimal agro-ecosystems which are socially, ecologically and economically sustainable. Terms such as "biological" and "ecological" are also used in an effort to describe the organic system more clearly. Requirements for organically produced foods differ from those for other agricultural products in that production procedures are an intrinsic part of the identification and labelling of, and claim for, such products. The principles for organic production, specifically for plants and plant products, are described in greater detail in international guidelines as mentioned below.

"Organic" is a labelling term that denotes products which have been produced in accordance with organic production standards and certified by a duly constituted certification body or authority. Organic agriculture is based on minimising the use of external inputs, avoiding the use of synthetic fertilisers and pesticides. Organic agriculture practices cannot ensure that products are completely free of residues, due to general environmental pollution. However, methods are used to minimise pollution of air, soil and water. Organic food handlers, processors and retailers adhere to standards to maintain the integrity of organic agricultural products. The primary goal of organic agriculture is to optimise the health and productivity of interdependent communities of soil, life, plants, animals and people.

Organic agriculture is constituted by production management systems which promote and enhance agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using cultural, biological and mechanical methods where possible, as opposed to using synthetic materials, to fulfil any specific function within the system. An organic production system is designed to:

a. enhance biological diversity within the whole system;
b. increase soil biological activity;
c. maintain long-term soil fertility;
d. recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimising the use of non-renewable resources;
e. rely on renewable resources in locally organized agricultural systems;
f. promote the healthy use of soil, water and air as well as minimise all forms of pollution thereof that may result from agricultural practices;
g. handle agricultural products with emphasis on careful processing methods in order to maintain the organic integrity and vital qualities of the product at all stages;
h. become established on any existing farm through a period of conversion, the appropriate length of which is determined by site-specific factors such as the history of the land, and the type of crops and livestock to be produced.

The concept of close contact between the consumer and the producer is a long established practice. Greater market demand, the increasing economic interests in production and the increasing distance between producer and consumer have stimulated the introduction of external control and certification procedures.

An integral component of certification is the inspection of the organic management system. Procedures for operator certification are based primarily on a yearly description of the agricultural enterprise as prepared by the operator in cooperation with the inspection body. Likewise, at the processing level, standards are also developed against which the processing operations and plant conditions can be inspected and verified. Where the inspection process is undertaken by the certification body or authority, there must be a clear separation between the inspection and certification functions. In order to maintain their integrity, certification bodies or authorities which certify the procedures of the

operator should be independent of economic interests with regard to the certification of operators.

Products will be regarded as bearing indications referring to organic production methods where, in the labelling or claims, including advertising material or commercial documents, the product, or its ingredients, is described by the terms "organic", "biodynamic", "biological", "ecological" or words of similar intent including diminutives which, in the country where the product is put on the market, suggest to the purchaser that the product or its ingredients were obtained according to organic production methods.

Guidelines or requirements concerning organic agriculture have been issued or are being drafted by different international institutions. One of these sets of guidelines has been published by The European Commission under the title "Council regulation (EEC) No 2092/91 of 24 June 1991 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs". Another set of guidelines is currently being worked out – in due coordination with the European Commission and other national and international institutions – in the Codex Alimentarius Commission under The Food and Agriculture Organization of the United Nations and The World Health Organisation. The current draft is entitled "Draft guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods" and is described in document ALINORM 99/22, incorporating Circular Letter CL 1998/18-FL. The final title of the guidelines will presumably be: "Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods".

Based on the development of organic agriculture, a number of organically produced foods, such as organic vegetables and cereals, have become available. A production of organic meat derived from animals fed on organic feeds, and organic eggs from fowls fed on organic feeds have also reached the market. To some extent, more processed organic food products have become available, such as organic bread and organic diary products derived from milk obtained from animals fed on organic feeds.

Until now organic production has not provided more advanced processed products. Organic agriculture has evolved as a grass-root movement and basically the principles of organic production have been to keep the products as simple and unprocessed as possible. This current concept of organic products has strongly inhibited the development of more

technically advanced organic products, limiting the possibility of a commercial break-through for organic products in a broader sense, e.g. organic plant derived chemicals or advanced processed organic additives leading to more advanced organic foods, organic cosmetics, organic pharmaceuticals or organic technical products, such as detergents.

In the above-mentioned definitions and regulations concerning organic agriculture there are some very clear limitations as to the chemicals that can be used in the production of organic foods as a means of securing the integrity of the concept of organic production. This, of course, strongly limits the possibilities of manufacturing more attractive or professional processed organic products. In relation to organic non-food products, meaning products from organic agriculture used for other purposes than food, there are no official regulations simply because there has not yet been a need for it, due to the limited development in this field.

In the following and in the attached claims, the term "organic" relates to the above and similar definitions.

SUMMARY OF THE INVENTION

The present invention provides a method of producing a number of organic emulsifiers and organic surfactants that are acceptable as components of organic food or organic non-food products. The method of the invention comprises:

- producing a plant organically, obtaining the oil or fat of said plant, refining said oil or fat and subjecting said oil or fat to chemical modification, or
- collecting the meat from an organic animal, obtaining the oil or fat of said meat, refining said oil or fat and subjecting said fat to chemical modification, or
- collecting the milk from an organic animal, obtaining the oil or fat of said milk, refining said oil or fat and subjecting said oil or fat to chemical modification, or
- collecting the egg from an organic bird, obtaining the oil or fat of said egg, refining said oil or fat and subjecting said oil or fat to chemical modification.

In the present application, an organic or organically produced product is defined as a product produced according to any of the above-mentioned principles and guidelines for organic agriculture, or similar guidelines. Preferably, the product has been certified as

such by a relevant authority. This definition covers all organic or organically produced products, including plants, animals or birds or any products or components derived therefrom.

The above-mentioned organic emulsifiers and organic surfactants can dramatically increase the quality and applicability of organic products. Surprisingly such products have not yet been produced.

The method of the invention and the organic emulsifiers or surfactants obtained by it are novel simply because nobody has ever before thought of combining the principles of organic farming with the advanced knowledge of chemical processing technology. On the one hand the people involved in organic farming have typically been idealistic and based on grass-root movements, without understanding of advanced industrial processing. On the other hand the people involved in industrial chemical processing technology have not even considered the possibility of developing products based on organic materials, because they typically have a very limited knowledge of the existence of organic products and because organic agriculture has a low-tech image.

Thus, the methods and products according to the invention are not only novel, but also involve an important inventive step by combining the knowledge and principles of two worlds that are usually not combined, whereby it is possible to dramatically improve the quality and industrial usefulness of organic products and provide the world with some technically satisfying organic cosmetics, organic foods, organic pharmaceuticals, organic technical products, and organic detergents that have never been possible before. The latter is simply because similar non-organic emulsifiers and detergents cannot be employed in an organic finished product, as the finished product would no longer be organic, since it would no longer be based primarily on organic ingredients.

The organic emulsifiers and organic surfactants according to the invention make it possible to produce much more advanced, professional and attractive organic products, thus giving organic products a much more serious and competitive image, e.g. in the following areas:

- Organic cosmetics, e.g. skin care products, hair care products, creams or lotions (e.g. facial creams, facial day creams, facial night creams, facial protective creams, facial

moisturisers, body lotions, cleansing milk etc.), sunscreens, hand soaps or shower soaps (liquid or solid soaps), deodorants, lipsticks, mascaras, liquid foundations, shampoos, "2 in 1" shampoos, dandruff shampoos, conditioners, etc.

- Organic foods, e.g. salad dressings, mayonnaise, sauces, ice cream, candy, spreads, margarines, bakery and confectionery products, coffee whiteners, etc.
- Organic pharmaceuticals, e.g. plant based drugs.
- Organic technical products, e.g. paints, varnishes, shoe polish, printing ink and plastics.
- Organic detergents, such as household cleaners (e.g. hand dishwasher detergents, automatic dishwasher detergents, laundry detergents and laundry aids etc.) and industrial cleaning products.

Accordingly the present invention provides cosmetic, food, pharmaceutical, technical or detergent compositions containing an organic emulsifier or detergent according to the invention.

More specifically the present invention provides the use of the organic emulsifiers or surfactants for preparing an organic cosmetic composition, an organic food composition, an organic pharmaceutical composition, an organic technical composition or an organic detergent composition.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides a method for producing organic surfactants and organic emulsifiers.

Said method consists essentially of the following three steps:

(a) isolation of organic oil(s) and/or fat(s) from organic source(s),
(b) refinement of the isolated organic oil(s) and/or fat(s), if necessary, and
(c) chemical modification of the refined oil(s) and fat(s) providing organic surfactant(s) and organic emulsifier(s).

A broad spectrum of organic emulsifiers and surfactants with various chemical structures can be produced according to the method of the present invention. The structures of such organic emulsifiers and surfactants are described in the literature, e.g. in Ullmann's Encyclopedia of Industrial Chemistry.

Organic surfactants produced according to the method of the present invention include anionic emulsifiers or surfactants of the general formula I, non-ionic emulsifiers or surfactants of the general formula II, and amphoteric emulsifiers or surfactants of the general formula III (see below).

More specifically, the invention comprises anionic surfactants produced by the method of the invention and having the general formula I:

$$R_1\text{-}X_n\text{-}Y\text{-}Z \qquad I$$

wherein R_1 is selected from optionally substituted $C_{6\text{-}30}$-alkyl, optionally substituted $C_{6\text{-}30}$-alkenyl, optionally substituted $C_{6\text{-}30}$-alkyl(aryl), and optionally substituted $C_{6\text{-}30}$-alkoxy;

X is $(CH_2\text{-}CH_2\text{-}O)$;

Y is SO_2, and SO_3;

Z is selected from hydrogen, Na^+, K^+, $½Ca^{++}$, $½Mg^{++}$, and NH_4^+; and

n is 0, 1, 2, 3 or 4.

Examples of surfactants with the general formula I are salts of alkyl sulphates, alkyl ether sulphates and alkyl sulfosuccinates. Especially preferred are sodium lauryl sulphate and lauryl ether sulphate.

Further, the invention comprises non-ionic surfactants produced by the method of the invention and having the general formula II:

$$R_2\text{-}X_n\text{-}Z_m\text{-}H \qquad II$$

wherein R_2 is selected from optionally substituted C_{6-30}-alkyl, optionally substituted C_{6-30}-alkenyl, optionally substituted C_{6-30}-alkyl(aryl), optionally substituted C_{6-30}-alkoxy, optionally substituted C_{6-30}-alkyl(aryloxy), and optionally substituted C_{6-30}-alkylamide;

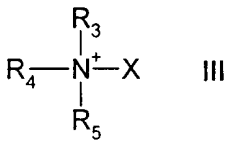
X is $(CH_2\text{-}CH_2\text{-}O)$;

Z is $(CH_2\text{-}CH(CH_3)\text{-}O)$; and

n is 0-60 and m is 0,3-6 with the proviso that n is 0,3-6 when m is 3-6, and $n+m \geq 1$.

Examples of surfactants with the general formula II are polyoxy ethylene fatty acid esters. Especially preferred are polyoxyethylene(8)stearate and polyoxyethylene(40)stearate.

The invention also comprises amphoteric surfactants produced by the method of the invention and having the general formula III:



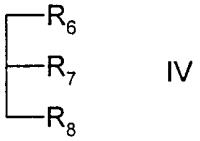
III

wherein R_3 and R_4 are independently selected from optionally substituted C_{1-10}-alkyl, and optionally substituted C_{2-10}-alkenyl;

R_5 is selected from optionally substituted C_{6-30}-alkyl, and optionally substituted C_{6-30}-alkenyl; and

X is selected from C_{1-30}-alkyl, oxo, $-CH_2CO_2^-$, $-(CH_2)_3SO_3^-$, and halogen such as fluorine, chlorine, iodine and bromine.

Organic emulsifiers and surfactants produced by the method according to the invention include compounds of the general formula IV:



IV

wherein at least one of R_6, R_7 or R_8 is independently selected from optionally substituted C_{6-30}-alkylcarbonyloxy, and optionally substituted C_{6-30}-alkenylcarbonyloxy;

one of R_6, R_7 or R_8 is independently selected from hydrogen, hydroxy, $R^{I}C(O)O$-, and $R^{II}OP(OH)(O)O$-, such as ethanoate, 2-hydroxypropanoate, 3,4-dicarboxy-3-hydroxybutanoate, 3-carboxy-2,3-dihydroxypropanoate, 3-carboxy-2-acetyloxy-3-hydroxypropanoate, 3-carboxy-3-acetyloxy-2-hydroxypropanoate, 3-carboxy-2,3-diacetyloxypropanoate;

R^{I} is selected from optionally substituted C_{1-30}-alkyl, and optionally substituted C_{2-30}-alkenyl, such as methyl;

R^{II} is selected from hydrogen, ammonium, C_{1-10}-alkyl, amino(C_{1-10}-alkyl), mono-, di- and tri(C_{1-10}-alkyl)amino(C_{1-10}-alkyl), such as aminoethyl, trimethylaminoethyl, inositol; and

the remaining of R_6, R_7 or R_8 is independently selected from hydrogen, hydroxyl, optionally substituted C_{6-30}-alkylcarbonyloxy, optionally substituted C_{6-30}-alkenylcarbonyloxy, and $R^{I}C(O)O$-.

Examples of emulsifiers with the general formula IV are acetic acid esters of mono- and diglycerides, lactic acid esters of mono- and diglycerides, citric acid esters of mono- and diglycerides and mixed acetylated tartaric acid esters of mono- and diglycerides.

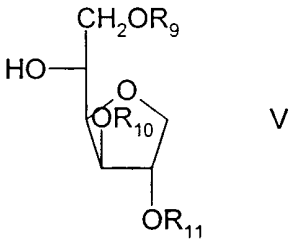
Organic emulsifiers and surfactants according to the invention include phospholipids.

Especially preferred examples of such emulsifiers and surfactants are phosphatidyl choline, phosphatidyl ethanolamine, phosphatidyl serine or phosphatidyl inositol, or lysophospholipids thereof.

Organic emulsifiers and surfactants according to the invention include fatty acid esters of a mono- or polysaccharide or fatty acid esters of the corresponding alcohol of a mono- or polysaccharide.

Especially preferred examples of such emulsifiers and surfactants are fatty acid esters of monosaccharides selected from the group consisting of trioses, tetroses, pentoses, hexoses, heptoses and octoses or their corresponding alcohols.

Organic emulsifiers and surfactants produced by the method of the invention include compounds of the general formula V:

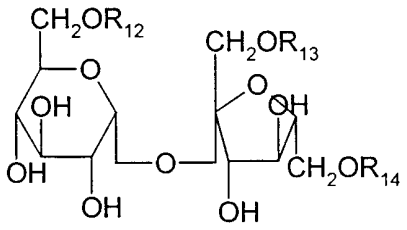


V

wherein R_9, R_{10} and R_{11} are independently selected from optionally substituted C_{6-30}-alkylcarbonyl, and optionally substituted C_{6-30}-alkenylcarbonyl, and hydrogen.

Examples of emulsifiers with the general formula V are sorbitan fatty acid esters and polyoxyethylene sorbitan fatty acid esters. Especially preferred are sorbitan monolaurate, sorbitan monopalmitate, sorbitan monooleate, sorbitan monostearate, sorbitan tristearate, polyoxyethylene(20)sorbitan monolaurate, polyoxyethylene(20)sorbitan monooleate, polyoxyethylene(20)sorbitan monopalmitate, polyoxyethylene(20)sorbitan monostearate and polyoxyethylene(20)sorbitan tristearate.

Further, the invention comprises organic emulsifiers and surfactants produced by the method of the invention and having the general formula VI:



VI

wherein at least one of R_{12}, R_{13} or R_{14} is independently selected from optionally substituted C_{6-30}-alkylcarbonyl, and optionally substituted C_{6-30}-alkenylcarbonyl;

and the remaining of R_{12}, R_{13} and R_{14} are independently selected from hydrogen, optionally substituted C_{6-30}-alkylcarbonyloxy, and optionally substituted C_{6-30}-alkenylcarbonyloxy.

Examples of emulsifiers with the general formula VI are common sucrose fatty acid esters.

In an especially preferred embodiment of the invention, only natural chemicals or chemicals derived from an organically produced organism are employed in the production of the organic emusifier or surfactant of the invention. For example citric acid derived from organically produced lemons or limes may preferably be employed in the production of citric acid esters of monoglycerides. Similarly, lactic acid derived from organically produced milk may preferably be employed in the production of lactic acid esters of monoglycerides or in the production of stearoyl lactylates.

In an especially preferred embodiment of the invention, only chemicals and processes that are not harmful to the environment are employed.

Among the most preferred organic emulsifiers and surfactants that can be produced according to the method of the invention, are emulsifiers and surfactants approved for the use in food products, since such emulsifiers are generally harmless to the living organism. Lists of such approved emulsifiers and surfactants can be provided by international authorities, such as the European Commission, the FAO/WHO (Codex), and national

authorities, e.g. the United States Food and Drug Administration (see Monographs for Emulsifiers for Foods, 2nd edition, 1985, European Food Emulsifiers Association).

Definitions

In the present context, fats and oils are defined as triacylglycerols or fatty acid esters of other carboxylic alcohols, where fats are solid at 20°C and oils are liquid at 20°C.

The term "technical composition" means any mixture of chemicals for industrial uses, such as industrial emulsions, lubricants, paints, varnishes, plastics, slipping agents, cooling liquids, etc.

In the present context, the term "C_{1-30}-alkyl" means a linear and branched hydrocarbon group having 1 to 30 carbon atoms, such as methyl, ethyl, propyl, *iso*-propyl, butyl, *iso*-butyl, *tert*-butyl, pentyl, *iso*-pentyl, hexyl, *iso*-hexyl, heptyl, *iso*-heptyl, octyl, *iso*-octyl, nonyl, *iso*-nonyl, decanyl, *iso*-decanyl, octanyl, decanyl, dodecanyl, tetradecanyl, hexadecanyl, octadecanyl, eicosanyl, docosanyl, tetracosanyl, hexacosanyl, and octacosanyl. Analogously, the term "C_{6-30}-alkyl" means a linear and branched hydrocarbon group having 6 to 30 carbon atoms, such as octanyl, decanyl, dodecanyl, tetradecanyl, hexadecanyl, octadecanyl, eicosanyl, docosanyl, tetracosanyl, hexacosanyl, and octacosanyl. The term "C_{1-10}-alkyl" is intended to cover linear and branched hydrocarbon groups having 1 to 10 carbon atoms, *e.g.* methyl, ethyl, propyl, *iso*-propyl, butyl, *iso*-butyl, *tert*-butyl, pentyl, *iso*-pentyl, hexyl, *iso*-hexyl, heptyl, *iso*-heptyl, octyl, *iso*-octyl, nonyl, *iso*-nonyl, decanyl, and *iso*-decanyl.

Preferred examples of "C_{1-30}-alkyl" are methyl, ethyl, propyl, *iso*-propyl, butyl, *tert*-butyl, decanyl, dodecanyl, tetradecanyl, hexadecanyl, octadecany, eicosanyl and docosanyl. Preferred examples of "C_{6-30}-alkyl" are dodecanyl, tetradecanyl, hexadecanyl, and octadecanyl, and especially preferred examples of "C_{1-10}-alkyl" are methyl, ethyl, propyl, *iso*-propyl, butyl and *tert*-butyl.

Similarly, the term "C_{2-30}-alkenyl" covers linear and branched hydrocarbon groups having 2 to 30 carbon atoms and comprising 1 to 15 unsaturated bonds. Examples of alkenyl groups are butenyl, pentadieneyl, hexenyl, hexadienyl, hepenyl, heptadienyl, octenyl, octadienyl, nonenyl, nonadienyl, decenyl, decadienyl, decatrienyl, decetetraenyl, dodecenyl, dodecadienyl, dodecatrienyl, dodecetetraenyl, dodecepentaenyl, tetradecenyl,

tetradecadienyl, tetradecatrienyl, tetradecetetraenyl, tetradecepentaenyl, tetradecehexaenyl, hexadecenyl, hexadecadienyl, hexadecatrienyl, hexadecetetraenyl, hexadecepentaenyl, hexadecehexaenyl, octadecenyl, octadecadienyl, octadecatrienyl, octadecetetraenyl, octadecepentaenyl, octadecehexaenyl, eicosenyl, eicosadienyl, eicosatrienyl, eicosatetraenyl, eicosapentaenyl, eicosahexaenyl, docosenyl, docosadienyl, docosatrienyl, docosatetraenyl, docosapentaenyl, docosahexaenyl, tetracosenyl, tetracosadienyl, tetracosatrienyl, tetracosatetraenyl, tetracosapentaenyl, tetracosahexaenyl, hexacosenyl, hexacosadienyl, hexacosatrienyl, hexacosatetraenyl, hexacosapentaenyl, hexacosahexaenyl, octacosenyl, octacosadienyl, octacosatrienyl, octacosatetraenyl, octacosapentaenyl, and octacosahexaenyl. The term "C_{6-30}-alkenyl" covers linear and branched hydrocarbon groups having 6 to 30 carbon atoms and comprising 1 to 15 unsaturated bonds. Examples of alkenyl groups are octenyl, octadienyl, decenyl, decadienyl, decatrienyl, decetetraenyl, dodecenyl, dodecadienyl, dodecatrienyl, dodecetetraenyl, dodecepentaenyl, tetradecenyl, tetradecadienyl, tetradecatrienyl, tetradecetetraenyl, tetradecepentaenyl, tetradecehexaenyl, hexadecenyl, hexadecadienyl, hexadecatrienyl, hexadecetetraenyl, hexadecepentaenyl, hexadecehexaenyl, octadecenyl, octadecadienyl, octadecatrienyl, octadecetetraenyl, octadecepentaenyl, octadecehexaenyl, eicosenyl, eicosadienyl, eicosatrienyl, eicosatetraenyl, eicosapentaenyl, eicosahexaenyl, docosenyl, docosadienyl, docosatrienyl, docosatetraenyl, docosapentaenyl, docosahexaenyl, tetracosenyl, tetracosadienyl, tetracosatrienyl, tetracosatetraenyl, tetracosapentaenyl, tetracosahexaenyl, hexacosenyl, hexacosadienyl, hexacosatrienyl, hexacosatetraenyl, hexacosapentaenyl, hexacosahexaenyl, octacosenyl, octacosadienyl, octacosatrienyl, octacosatetraenyl, octacosapentaenyl, and octacosahexaenyl.

Preferred examples of "C_{2-30}-alkenyl" are linear hydrocarbon groups having 1 to 4 unsaturated bonds such as dodecenyl, dodecadienyl, tetradecenyl, tetradecadienyl, tetradecatrienyl, hexadecenyl, hexadecadienyl, hexadecatrienyl, octadecenyl, octadecadienyl, octadecatrienyl, and octadecetetraenyl. Preferred examples of "C_{6-30}-alkenyl" are linear hydrocarbon groups having 1 to 5 unsaturated bonds such as dodecenyl, dodecadienyl, tetradecenyl, tetradecadienyl, tetradecatrienyl, hexadecenyl, hexadecadienyl, hexadecatrienyl, octadecenyl, octadecadienyl, octadecatrienyl, and octadecetetraenyl.

In the present context, *i.e.* in connection with the terms "alkyl" and "alkenyl", the term "optionally substituted" means that the group in question may be substituted one or several

times, preferably 1-5 times, with group(s) selected from hydroxy (which when bound to an unsaturated carbon atom may be present in the tautomeric keto form), C_{1-10}-alkyl, hydroxy(C_{1-10}-alkyl), C_{1-10}-alkylcarbonyloxy, carboxy, C_{1-10}-alkoxycarbonyl, C_{1-10}-alkoxy, C_{2-10}-alkenyloxy, oxo (forming a keto or aldehyde functionality), C_{1-10}-alkylcarbonyl, formyl, aryl, aryloxycarbonyl, aryloxy, arylcarbonyl, heteroaryl, heteroaryloxycarbonyl, heteroaryloxy, heteroarylcarbonyl, amino, mono-, di- and tri(C_{1-10}-alkyl)amino, carbamoyl, mono-, di- and tri(C_{1-10}-alkyl)aminocarbonyl, amino-C_{1-10}-alkyl-aminocarbonyl, mono-, di- and tri(C_{1-10}-alkyl)amino-C_{1-10}-alkyl-aminocarbonyl, C_{1-10}-alkylcarbonylamino, cyano, guanidino, carbamido, C_{1-10}-alkanoyloxy, sulphono, C_{1-10}-alkylsulphonyloxy, nitro, sulphanyl, C_{1-10}-alkylthio, halogen, where any aryl and heteroaryl may be substituted as specifically described below for "optionally substituted aryl and heteroaryl".

Preferably, the substituents are selected from hydroxy, C_{1-10}-alkyl, hydroxy(C_{1-10}-alkyl), C_{1-10}-alkylcarbonyloxy, carboxy, C_{1-10}-alkoxycarbonyl, C_{1-6}-alkoxy, C_{1-6}-alkoxycarbonyl, C_{1-6}-alkylcarbonyl, formyl, aryl, aryloxycarbonyl, arylcarbonyl, heteroaryl, amino, mono- and di(C_{1-6}-alkyl)amino, carbamoyl, mono- and di(C_{1-6}-alkyl)aminocarbonyl, amino-C_{1-6}-alkyl-aminocarbonyl, mono- and di(C_{1-6}-alkyl)amino-C_{1-6}-alkyl-aminocarbonyl, C_{1-6}-alkylcarbonylamino, where aryl and heteroaryl may be substituted 1-5 times, preferably 1-3 times, with C_{1-4}-alkyl, C_{1-4}-alkoxy, nitro, or amino. Especially preferred examples are hydroxy, C_{1-10}-alkyl, hydroxy(C_{1-10}-alkyl), C_{1-10}-alkylcarbonyloxy, carboxy, C_{1-10}-alkoxycarbonyl,

In the present context the term "aryl" means a fully or partially aromatic carbocyclic ring or ring system, such as phenyl, naphthyl, 1,2,3,4-tetrahydronaphthyl, anthracyl, phenanthracyl, pyrenyl, benzopyrenyl, fluorenyl and xanthenyl, among which phenyl is a preferred example.

The term "heteroaryl" means a fully or partially aromatic carbocyclic ring or ring system where one or more of the carbon atoms have been replaced with heteroatoms, *e.g.* nitrogen (=N- or -NH), sulphur, and/or oxygen atoms. Examples of such heteroaryl groups are oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, pyrrolyl, imidazolyl, pyrazolyl, pyridinyl, pyrazinyl, pyridazinyl, piperidinyl, coumaryl, furyl, quinolyl, benzothiazolyl, benzotriazolyl, benzodiazolyl, benzooxozolyl, phthalazinyl, phthalanyl, triazolyl, tetrazolyl, isoquinolyl, acridinyl, carbazolyl, dibenzazepinyl, indolyl, benzopyrazolyl, and phenoxazonyl.

In the present context, *i.e.* in connection with the terms "aryl" and "heteroaryl", the term "optionally substituted" means that the group in question may be substituted one or several times, preferably 1-5 times, in particular 1-3 times, with group(s) selected from hydroxy (which when present in an enol system may be represented in the tautomeric keto form), C_{1-6}-alkyl, C_{1-6}-alkoxy, oxo (which may be represented in the tautomeric enol form), carboxy, C_{1-6}-alkoxycarbonyl, C_{1-6}-alkylcarbonyl, formyl, aryl, aryloxy, aryloxy-carbonyl, arylcarbonyl, heteroaryl, amino, mono- and di(C_{1-6}-alkyl)amino; carbamoyl, mono- and di(C_{1-6}-alkyl)aminocarbonyl, amino-C_{1-6}-alkyl-aminocarbonyl, mono- and di(C_{1-6}-alkyl)amino-C_{1-6}-alkyl-aminocarbonyl, C_{1-6}-alkylcarbonylamino, cyano, guanidino, carbamido, C_{1-6}-alkanoyloxy, sulphono, C_{1-6}-alkylsulphonyloxy, nitro, sulphanyl, dihalogen-C_{1-4}-alkyl, trihalogen-C_{1-4}-alkyl, halogen, where aryl and heteroaryl representing substituents may be substituted 1-3 times with C_{1-4}-alkyl, C_{1-4}-alkoxy, nitro, cyano, amino or halogen. Preferred examples are hydroxy, C_{1-6}-alkyl, C_{1-6}-alkoxy, carboxy, C_{1-6}-alkoxy-carbonyl, C_{1-6}-alkylcarbonyl, aryl, amino, mono- and di(C_{1-6}-alkyl)amino, and halogen, wherein aryl may be substituted 1-3 times with C_{1-4}-alkyl, C_{1-4}-alkoxy, nitro, cyano, amino or halogen.

"Halogen" includes fluoro, chloro, bromo, and iodo.

Isolation

The first step in the method of the invention comprises isolating an organic oil or fat from an organic source. According to the invention the organic source may be any living organism produced organically. In connection with the invention an organic or organically produced living organism is defined as an organism produced according to any of the above-mentioned principles and guidelines for organic agriculture and farming, or similar guidelines, the product preferably being certified as being organic by a relevant authority.

Plant oils and fats

In a preferred embodiment of the invention the organically produced organism is a plant. Any organically produced plant may be used and any part of the plant may be employed as a source of the oil or fat. Such parts may for example be fruits, flowers, leaves, stems, wood (from trees), bark, roots, cell cultures, tissue cultures, etc.

Among the especially preferred organically produced plants are plants commonly used for oil or fat production, giving oils and fats such as: babassu oil, boleko oil, borneo tallow, castor oil, cereal oils, cocoa butter, coconut oil, corn (maize) oil, cottonseed oil, grape seed oil, hazelnut oil, hemp seed oil, illipé fat, kapok oil, kenaf seed oil, linseed oil, lupine oil, mowrah fat, mustard seed oil, néou oil, niger seed oil, oiticica oil, okra oil, olive oil, palm oil, palmkernel oil, parinarium oil, peanut oil, perilla oil, poppy seed oil, pumpkin seed oil, rapeseed oil, safflower oil, sesame oil, shea butter, soybean oil, sunflower oil, teaseed oil, tung oil, vernonia oil, walnut oil, etc.

The process of obtaining such plant derived oils and fats can vary depending of the source and many possible processing procedures are available. Such processes are reviewed in detail in Ullmann's Encyclopedia of Industrial Chemistry.

Generally the storage and handling of the raw materials must be considered carefully to maintain the optimum quality of the isolated oil or fat. The isolation of the oil or fat from the plant source generally includes two steps, expelling and solvent extraction.

Oilseeds are normally preexpelled to a residual fat content of about 20%, and the expeller cake is then extracted to 1-2% fat. Preexpelling is omitted if the fat content of the seed is 20% or less. Most of the fat present in seeds and fruit pulp is in the endosperm and hypocotyl cells, with much less in the seed coat. The processing conditions are largely determined by the size and stability of the oil-containing cells. With palm fruit and olives, mere heating or boiling with water is sufficient to disrupt the membranes of the oil-containing cells to liberate the oil. Nearly all oleaginous seeds must, however, first be comminuted and thermally pre-treated to isolate the oil or fat in an acceptable yield. Comminution partially destroys the cellular structure, increasing the total internal surface and facilitating access to the oil within the seed.

Coarse materials such as copra are first broken by passage through interlocking rolls. Fluted rolls are used for nearly all other seeds. Smooth or so-called flaking rolls are used to complete seed comminution.

The comminuted seed is conditioned prior to expelling by moistening and heating in suitable equipment. During this treatment, lipoproteins decompose, proteins coagulate, and intracellular oil bodies coalesce. The cell walls themselves are not macerated during

conditioning. Coagulation of protein facilitates expelling and subsequent percolation in the extractor. Undesirable enzymes and microorganisms are deactivated at temperatures above 80°C and in the presence of sufficient moisture.

Expelling separates the oil from the solid phase, the so-called expeller cake, and can be carried out in continuous or batch presses. The expeller oil still contains so-called foots which must be removed by filtration.

Very much lower residual fat contents can be achieved by solvent extraction than by expelling. Seed material with an oil content of about 20% and expeller cake with 15-25% fat are preferably subjected to solvent extraction. Both must be flaked prior to extraction. This pre-treatment creates a large internal surface and an effective subsequent extraction.

Ideally, the extraction solvent should dissolve only glycerides but not undesirable components such as coloring matter and gums. The solvents must not contain toxic components, and should be recoverable with minimum loss, be safe in handling, and be readily removable from the extracted material. For these reasons aliphatic hydrocarbons, especially pentane, hexane or heptane, are preferred. Technical hexane with a boiling point range of 55-70°C has proved to be optimal. Hexane can be readily removed from the oil at temperatures below 100°C in vacuo and can be stripped from the meal with steam. The solubility of hexane in the condensed water is only 0.1%.

For special purposes, e.g., the production of heat-labile fatty acids, lower-boiling hydrocarbons such as pentanes are sometimes used. Extraction with propane or carbon dioxide under supercritical conditions is a very useful alternative in the case of heat-labile products. Castor oil, being relatively polar, is preferably extracted with the higher-boiling heptane. Alcohols (methanol, ethanol, propanol, and butanol) and furfurol are especially suited for the extraction of relatively wet materials. Extraction of oilseeds with alcohols leads to relatively high concentrations of phosphatides, glycolipids, carbohydrates, and similar constituents in the crude oil, although the glycerides can in principle be concentrated by cooling or extraction of the alcoholic solutions. Alcohols are generally not used as primary extraction solvents.

Chlorinated hydrocarbons such as trichloroethylene and dichloromethane are of interest because of their high extraction capacity but are not preferred because of the potential

toxicity risk from residual solvent. Processes in which the oil is displaced by hot water are also an option.

There are numerous extraction technologies available involving various types of equipment. Oilseeds can preferably be extracted in a counter-current process: pure solvent is contacted with material that has already been largely extracted, and the oil-rich solution is contacted with non-extracted material. Such extractions can be performed either continuously or in a batch process.

In a discontinuous process the solvent successively passes through a battery of up to 8 batch extractors. A more environmentally friendly extraction procedure could be based on catalytic enzymes, such as cellulases, liberating the fatty contents of the plant cells. In such a procedure several fractionation methods could subsequently be applied, e.g. centrifugation to obtain a purified oil or fat fraction. An enzymatically based process would be ideal for processing of plant cell cultures. Production of plant cells in tanks according to the principles of organic production could be a convenient production method, especially in the case of labile fats and oils.

Animal oils and fats

In another preferred embodiment of the invention, the organically produced organism is an animal. In connection with the invention any organically produced animal may be employed as a source of the fat or oil, for example small or large land animals, fish, birds or reptiles.

Furthermore the source of the fat or oil may be any part of the organically produced animal, including eggs or milk.

Among the especially preferred organically produced animals are animals commonly used for oil or fat production, giving oils and fats such as: land animal oils and fats, e.g. beef tallow, chicken fat, goat fat, goose fat, horse fat, lard, mutton tallow, etc.; marine oils and fats, e.g. cod oil, halibut oil, herring oil, menhaden oil, etc.

The process of obtaining such animal derived oils and fats can vary depending of the source and many possible processing procedures are available. In the following the most important steps are reviewed.

Land-Animal Fats

Animal fats can be readily isolated from tissue by heating since the cell membranes of animal cells are much weaker than those of plant cells. The intracellular fat expands on heating and disrupts the membrane. Extraction with solvents is limited to offal. Fatty tissue is particularly susceptible to decomposition so that rapid processing is necessary if refrigeration is not possible. Microbial and autolytic degradation rapidly leads to oxidation, hydrolysis, colour deterioration, and unpleasant odours and flavours, which are difficult to remove from the fat. The free fatty acid content therefore serves as a convenient, primary quality criterion.

In "dry rendering", the comminuted fatty tissue is digested by cooking in steam-jacketed vessels equipped with agitators. Local overheating of fatty tissue must be avoided since this can easily lead to unpleasant off-flavours. In modern automated plants for working up animal byproducts, the raw material is first heated and sterilised in a dry-rendering vessel. The resulting sludge is then separated, possibly after pre-drying into crude meal (cracklings) and a liquid phase containing fat and water by a continuous screw press (Krupp Kontipress process) or by a decanter, i.e., a centrifuge with a built-in screw conveyor (Alfa-Laval Centrimeal process). The fat is finally separated from the aqueous phase by centrifuging. The 7-12% residual fat content of the meal can be reduced to 1-4% by solvent extraction.

"Wet rendering", which involves treating the fatty tissue with direct steam, tends to give better yields and quality than dry rendering. In modern continuous rendering plants (e.g., as built by Alfa-Laval, Westfalia, and Sharples) selected tissue is coarsely comminuted and heated to 50-60°C. It is then heated quickly to 80-90°C with direct steam to deactivate oxidising enzymes. The greaves are then separated in a decanter centrifuge, and the fat is clarified by further centrifuging, cooled, possibly texturised, and packed. Fat obtained by this method in up to 99% yield contains 0.1-0.2% moisture; the content of free fatty acids is virtually identical with that of the raw material. This mild processing technique minimises the formation of oxidation products.

Marine Oils

Fish oils are generally isolated by rendering. Crushed fish (herring, menhaden, sardines, pilchards) with a dry matter content of 15-22% is first cooked in closed vessels at relatively low pressure. This operation sterilises the fish and coagulates the protein to produce a fish mass that can be easily pressed. Subsequent screw pressing separates most of the water and oil from the press cake. The press water is pre-purified over screens or with a decanter (desludger) and then separated by centrifugation into crude fish oil and stickwater (or glue water). The press cake (about 50% water) is dried and sometimes also extracted with a solvent. Eventually a process employing liquefied propane as the extraction solvent can be utilised. Such a method can also be used to fractionate fish liver oils.

Fats and oils obtained from microorganisms.

In another preferred embodiment of the invention, the organically produced organism is a microorganism. Any organically produced microorganism may be employed as a source of the oil or fat. Such microorganisms may for example be bacteria, yeast, fungi, algae, etc. Extraction of the fat or oil fraction from such microorganisms follows basic extraction principles some of which are mentioned above. The preferred extraction solvents are organic solvents that are water-immiscible, e.g. pentane, hexane, heptane, ethyl acetate, n-butanol or higher alcohols.

A more environmentally friendly extraction procedure would be based on catalytic enzymes, liberating the fatty contents of the microorganisms. In such a procedure several fractionation methods could be applied, e.g. centrifugation to obtain a purified oil or fat fraction.

Refinement

The second step in the method of the invention comprises refining the isolated organic oil or fat. This step is optional in the sense that it is not always required, since some crude oils may be suitable for chemical modification without refinement.

The aim of the refinement step is to prepare the organic oil or fat for the chemical modification necessary to produce the organic emulsifiers or surfactants according to the invention.

Refinement of the isolated organic oil or fat is an optional step before the chemical modification by which the organic emulsifier or surfactant according to the invention is produced.

Crude oils and fats obtained by expelling, extraction, or rendering contain trace components that are undesirable for stability and further processing. These substances include seed particles, dirt, phosphatides, carbohydrates, proteins, trace metals, pigments, waxes, oxidation products of fatty acids, and toxic components such as polycyclic aromatic hydrocarbons, gossypol, mycotoxins, sulfur compounds (in fish and cruciferous oils). The aim of refining the oils and fats according to the invention is to remove these undesirable components as much as possible without significantly affecting the concentration of desirable constituents such as polyunsaturated fatty acids, and without significant loss of the major glyceride components. Refining usually involves the following steps:

- Precleaning to remove phosphatides (degumming).
- Neutralisation by treatment with lye or by distillation.
- Decolorization by adsorptive treatments (bleaching).
- Deodorization or stripping in vacuo.

There are many possible refinement procedures which are described in detail in the literature, e.g. in Ullmann's Encyclopedia of Industrial Chemistry.

Chemical modification

The last step in the method according to the present invention comprises chemical modification of the refined organic oils and fats to produce organic emulsifiers or surfactants, e.g. with the general formulae I, II, III, IV, V, and VI.

It should be understood that the term "chemical modification" comprises one or more chemical reactions performed on the optionally refined organic oils and fats, and includes all reactions which can be applied to refined oils and fats.

Examples of such chemical modifications include the following reactions:

- hydrolysis of carboxylic esters,

- ammonolysis of carboxylic esters,
- transesterification of carboxylic esters,
- reduction of carboxylic esters,
- amination of carboxylic esters,
- sulfonation of carboxylic esters,
- reaction of carboxylic esters with Grignard reagents,
- reaction of carboxylic esters with alkyl-lithium reagents,
- salt formation of carboxylic acids,
- reduction of carboxylic acids,
- esterification of carboxylic acids,
- alpha-halogenation of carboxylic acids,
- conversion of carboxylic acids into the corresponding acid halide,
- sulfonation of carboxylic acids,
- esterification of carboxylic alcohols,
- oxidation of carboxylic acids,
- nucleophilic substitution of carboxylic acids,
- amination of carboxylic acids,
- sulfonation of carboxylic acids, and
- conversion of carboxylic alcohols into phosphatides.

The obtained chemically modified oils and fats can be further modified using chemical reactions such as oxidation, reduction, salt formation, aliphatic nucleophilic substitution, aromatic electrophilic substitution, aliphatic electrophilic substitution, aromatic nucleophilic substitution, free-radical substitution, addition to carbon-carbon multiple bonds, addition to carbon-hetero multiple bonds, elimination, rearrangements and polymerization. The products obtained by the above-mentioned chemical reactions can be subjected to further chemical reactions.

In addition the term "chemical modification" includes reactions performed in the aliphatic chains of the organic oils and fats, such as:

- addition reactions, e.g. addition of halogens, hydrogen halides, sulfuric acid, and free radicals, and hydrogenation, hydration, hydroxylation, halohydrin formation, alkylation, hydroboration-oxidation, and dimerisation,
- halogenation,

- nucleophilic substitution,
- reduction, and
- elimination reactions.

The above-mentioned reactions represent reactions generally known to a person skilled in the art of organic chemistry, and are described in detail in the scientific literature, e.g. Jerry March, 1992.

APPLICATIONS

The organic emulsifiers and surfactants according to the invention have numerous applications, within the fields of organic cosmetic compositions, organic food compositions, organic pharmaceutical compositions, organic technical compositions and organic detergent compositions. The products resulting from substituting the conventional emulsifiers and surfactants (produced from non-organic sources) with organic emulsifiers and surfactants are true organic end-products wherein all ingredients originating from possible organic sources are produced organically. The following are typical non-limiting examples of applications within these areas.

Organic skin care products

An organic skin care product according to the present invention may typically be produced by mixing an oil phase consisting of lipophilic emulsifiers according to the invention and emollients, with an aqueous phase consisting of water and water soluble compounds, typically at elevated temperatures. In a preferred embodiment of the invention the emollient is an organically produced oil or fat, or an organic ester produced according to the invention. Also, the organic skin care product contains a preservative to prevent microbial growth. Preferably, the preservative is organically produced, e.g. a surface active organic preservative produced according to the present invention, such as glyceryl mono caprylate. After mixing and cooling a fragrance is optionally added. Preferably, the fragrance is an organically produced essential plant oil.

By the method of the invention, it is thus possible to produce a skin care product, where all or most ingredients are derived from organically produced plants. Typical non-limiting examples of products in this category include creams such as facial creams, facial day creams, facial night creams, facial protective creams and facial moisturisers etc; lotions

such as body lotions and cleansing milk etc; sunscreens, soaps such as liquid hand soaps, solid hand soaps, liquid shower soaps and solid shower soaps; deodorants such as deodorant roll-ons and deodorant sticks; lipsticks; mascaras; liquid foundations and cleansers.

Typical non-limiting examples of emulsifiers/surfactants that may be produced according to the present invention are sodium stearoyl lactylate, glycol stearate, glycol palmitate, glycerol stearate, glycerol palmitate, glycerol oleate, sucrose cocoate, sorbitan stearate, stearyl citrate.

Typical non-limiting examples of emollients/thickeners that may be produced according to the present invention are monoglycerides, diglycerides, triglycerides (long-chain, medium-chain, and short-chain), stearyl alcohol, cetyl alcohol, isopropyl isostearate, stearic acid, isobutyl palmitate, isocetyl stearate, oleyl alcohol, isopropyl laurate, hexyl laurate, decyl oleate, octadecan-2-ol, isocetyl alcohol, cetyl palmitate, isopropyl myristate, isopropyl palmitate, isopropyl stearate, butyl stearate, butyl myristate, isostearic acid, palmitic acid, isopropyl linoleate, lauryl lactate, isostearyl isostearate, myristyl lactate, decyl oleate, myristyl myristate, etc.

Organic hair care products

An organic hair care product according to the invention may typically consist of an organic anionic surfactant, an organic amphoteric surfactant, an organic cationic surfactant, and/or an organic foaming agent. Furthermore, the product may contain water, dyes, perfume, pH-regulators, NaCl and preservatives. Typically, a one-pot manufacturing procedure is employed, where all the ingredients are mixed one at a time.

Preferably, the preservative is organically produced, e.g. a surface active organic preservative produced according to the present invention, such as glyceryl mono caprylate.

Also preferably, the fragrance is an organically produced essential plant oil.

By the method of the invention, it is thus possible to produce a skin care product, where all or most ingredients are derived from organically produced plants. Typical non-limiting examples of products in this category include shampoos, "2 in 1" shampoos, dandruff shampoos, conditioners, etc.

Typical non-limiting examples of organic anionic surfactants that may be produced according to the present invention are sodium lauryl sulphate, ammonium lauryl sulphate, magnesium lauryl sulphate, triethylamine lauryl sulphate, monoethylamine lauryl sulphate, sodium laureth sulphate, ammonium laureth sulphate, magnesium laureth sulphate, trimethylamine laureth sulphate, monoethylamine laureth sulphate, sodium myreth sulphate, ammonium myreth sulphate, magnesium myreth sulphate, TEA myreth sulphate, MEA myreth sulphate, sulphosuccinates, alkyl phosphates, etc.

Typical non-limiting examples of organic amphoteric surfactants that may be produced according to the present invention are cocamidopropyl betaine, cocoamphocarboxylglycinate, cocobetaine, etc.

Typical non-limiting examples of cationic surfactants that may be produced according to the present invention are cetyl trimethyl ammonium chloride, cetyl trimethyl ammonium bromide, distearyl dimethyl ammonium chloride, benzyl dimethyl stearyl ammonium chloride, guar hydroxy propyl trimethylammonium chloride, etc.

Hair care products according to the invention may also contain a fragrance, and preferably, the fragrance is an organically produced essential plant oil.

By the method of the invention, it is thus possible to produce a hair care product, where all or most ingredients are derived from organically produced plants.

Organic colour cosmetics.

Organic colour products according to the invention include, but are not limited to, lip products, mascara, foundations, concealers and tinted moisturisers.

They are very different products by nature and are therefore produced in various ways. Such products can be categorised by their viscosity at room temperature. Some have a very high viscosity e.g. lip sticks, concealers and mascara, while others have a lower viscosity e.g. liquid foundations and tinted moisturisers. These products often consist of various waxes, emollients, emulsifiers and pigments. Preferred pigments are iron oxide and plant derived colourants, preferably derived from organically produced plants.

Typical non-limiting examples of organic emollients and emulsifiers used in the production of these products according to the present invention are, cetyl alcohol, stearoyl alcohol, oleyl alcohol, octacosanol, hexacosanol, isopropyl myristate, decyl oleate, cetyl palmitate, isocetyl stearate, stearoyl stearate, etc.

Furthermore, such products with a high viscosity typically may also contain natural waxes preferably organically produced, e.g. carnauba wax, candelilla wax, ceresine wax, bees-wax, etc.

Optionally, colour cosmetics according to the invention may also contain a fragrance and preferably, the fragrance is an organically produced essential plant oil.

By the method of the invention, it is thus possible to produce a colour cosmetic product, where all or most ingredients are derived from organically produced plants.

Organic washing powders

In general organic washing powders according to the invention may be produced by combining organic surfactants according to the invention with other active ingredients. Such organic surfactants usually comprise 5 to 90 % w/w and preferably 5 to 60 % w/w of the formulation. Other optional ingredients are water-softening agents and builders (usually 5 to 30 % w/w of the formulation), enzymes (usually below 2 % w/w of the formulation) and eventually bleaching agents (usually below 1 % w/w of the formulation).

The organic surfactant ingredients can be non-ionic, anionic, cationic or amphoteric and is responsible for the washing-activity. Water softening-agents and builders are added to washing powders to improve the cleansing action, and to prevent precipitation of magnesium, calcium and iron salts. Usually, mixtures of two or more of the following compounds are used as water softening agents and builders: Sodium citrate, phosphates, zeolites, sodium carbonate and silicates. Enzymes are sometimes added to washing powders to degrade fats, proteins and polysaccharides, and generally one or more of the following types are used: Lipases, amylases, cellulases, and proteases. Bleaching agents can be silicates, "optical white," or active oxygen compounds *e.g.* perborates.

Optionally, organic washing powders according to the invention may also contain a fragrance and preferably, the fragrance is an organically produced essential plant oil.

By the method of the invention, it is thus possible to produce a washing powder, where all or most ingredients are derived from organically produced plants.

Organic household and industrial cleaning products:

Numerous organic household and industrial cleaning products may be produced according to the invention. Such products generally comprise an organic surfactant or emulsifiers according to the invention either alone or in combination with various other ingredients.

The organic surfactant ingredients can be non-ionic, anionic, cationic or amphoteric.

By the method of the invention, it is thus possible to produce a skin care product, where all or most ingredients are derived from organically produced plants. Typical non-limiting examples of products in this category include hand dishwasher detergents, automatic dishwasher detergents, laundry detergents and laundry aids etc.

Non-limiting examples of other optional ingredients are: water, water-softening agents, enzymes and fragrances as mentioned above.

By the method of the invention, it is thus possible to produce household or industrial cleaning products, where all or most ingredients are derived from organically produced plants.

Organic food and pharmaceutical products

Various organic food or pharmaceutical products may be produced according to the invention.

Food preparations contain ingredients of dietary value, just like pharmaceuticals contain ingredients of therapeutic value. Furthermore, such products often contain emulsifiers or surfactants to obtain an acceptable product formulation.

Organic food and pharmaceutical preparations according to the invention are produced by employing organic emulsifiers and surfactants in combination with the primary dietary or

therapeutic ingredient and preferably these dietary or therapeutic ingredients are produced organically. Typical non-limiting examples of such organic foods according to the invention are: dairy products, sauces, spreads, margarines, coffee whiteners, salad dressing, mayonnaise, bakery and confectionery products e.g. bread, meat products, ice cream, candy, chewing gum, etc.

Typical non-limiting examples of such organic pharmaceutical products are tablets, capsules, lozenges, chewing gum, fluids, granulates, sprays (e.g. aerosol), inhalants, ointments, gels, liniments, emulsions (e.g. cream or lotion), etc.

By the method of the invention, it is thus possible to produce food or pharmaceutical products, where all or most ingredients are derived from organically produced plants.

EXAMPLES

Example 1

The purpose of the following procedure is to produce an organic emulsifier according to the invention, organic glyceryl monostearate. The steps of the method according to the invention are described in the following.

Isolation of palm oil

Oil palms *(Elaeis guineensis)* are grown in Malaysia according to the principles of organic production. Thus no pesticides or chemical fertilisers are employed in the production and the highest degree of caution is taken not to disturb the surrounding environment. Furthermore the production is certified as organic by an authorised European organic certification institution.

The fruits contain 35-60% oil, depending on the moisture content. The fresh palm fruits contain very active fat-splitting enzymes (lipases) which must be deactivated as quickly as possible prior to isolating the oil. Since lipases are particularly active in damaged fruits, the whole fruit bunches are sterilised by heating with live steam in autoclaves to deactivate the enzymes and loosen the fruit from the bunches.

The sterilised fruit bunches are threshed in a rotary drum stripper consisting of longitudinal channel bars; the fruit falls through whereas the empty bunch stem is retained

in the drum. The separated, sterilised fruits are then converted into an oily mash by a mechanical stirring process known as digestion. The digested fruit mass is passed through screw presses, and the liquor from the press is clarified by static settling or by using decanter centrifuges.

Refinement

The oil is then treated with citric acid and bleaching earth to remove foreign matter and traces of copper and iron compounds. Finally the oil is neutralised by distillation at a temperature of up to 270°C and at a pressure of 0.5-0.8 kPa (5-8 mbar).

Chemical modification

The oil is hydrolyzed by boiling the oil in 6 M NaOH (1:2 W/W) for four hours. The mixture is diluted by addition of an equal amount of water. Concentrated hydrochloric acid is slowly added until the mixture is weakly acidic and then the mixture is cooled to room temperature. The fatty acid (mixture of primarily stearic acid and palmitic acid), which is referred to as stearic acid in the following, is isolated by filtration and recrystallized from methanol.

Glyceryl monostearate is produced by direct esterification. Three equivalents of glycerol are mixed with one equivalent of stearic acid and 1% (W/W) concentrated sulfuric acid is added. The mixture is heated at 150°C for four hours. Water produced by the reaction is allowed to escape from the reactor. The mixture is slowly cooled to room temperature. Glyceryl monostearate precipitates and is isolated by filtration.

Example 2

The purpose of the following procedure is to produce an organic emulsifier according to the invention, organic sorbitan monooleate. The steps of the method according to the invention are described in the following.

Isolation of olive oil

Olive trees *(Olea europaea)* are grown in Greece according to the principles of organic production. Thus no pesticides or chemical fertilisers are employed in the production of the olives and the highest degree of caution is taken not to disturb the surrounding

environment. Furthermore the production is certified as organic by an authorised European organic certification institution.

The quality of the obtained olive oil depends on the ripeness of the olives, the type of harvesting (picking, shaking), intermediate storage, and type of processing. Olives contain 38-58% oil and up to 60% water. The ripe olives are processed as quickly as possible since lipases in the pulp cause rapid hydrolysis of the oil, impairing its quality. The mashed pulp is separated in a horizontal decanter and the crude oil is recentrifuged after addition of wash water and thereby clarified.

Refinement

The oil is treated with citric acid and bleaching earth to remove foreign matter. Subsequently the oil is neutralised by distillation.

Chemical modification

The oil is hydrolyzed by boiling the oil in 6 M NaOH (1:2 W/W) for four hours. The mixture is diluted by addition of an equal amount of water. Concentrated hydrochloric acid is slowly added until the mixture is weakly acidic and then the mixture is cooled to room temperature. The fatty acid (primarily oleic acid) is isolated by filtration and recrystallized from methanol.

Sorbitan monooleate is prepared by mixing equimolar amounts of sorbitol and oleic acid and heating the mixture at 225°C for two hours. Sodium hydroxide (0.3% W/W) is used to catalyze the reaction. To protect the oleic acid carbon chain from oxidation, the reaction is performed under nitrogen, but the water produced from the reaction is allowed to escape from the reactor.

Example 3

The purpose of the following procedure is to produce an organic emulsifier according to the invention, organic sodium stearoyl lactylate. The steps of the method according to the invention are described in the following.

Isolation of palm oil

Oil palms *(Elaeis guineensis)* are grown in Malaysia according to the principles of organic production. Thus no pesticides or chemical fertilisers are employed in the production and the highest degree of caution is taken not to disturb the surrounding environment. Furthermore the production is certified as organic by an authorised European organic certification institution.

The fruits contain 35-60% oil, depending on the moisture content. The fresh palm fruits contain very active fat-splitting enzymes (lipases) which must be deactivated as quickly as possible prior to isolating the oil. Since lipases are particularly active in damaged fruits, the whole fruit bunches are sterilised by heating with live steam in autoclaves to deactivate the enzymes and loosen the fruit from the bunches.

The sterilised fruit bunches are threshed in a rotary drum stripper consisting of longitudinal channel bars; the fruit falls through whereas the empty bunch stem is retained in the drum. The separated, sterilised fruits are then converted into an oily mash by a mechanical stirring process known as digestion. The digested fruit mass is passed through screw presses, and the liquor from the press is clarified by static settling or by using decanter centrifuges.

Refinement

The oil is then treated with citric acid and bleaching earth to remove foreign matter and traces of copper and iron compounds. Finally the oil is neutralised by distillation at a temperature of up to 270°C and at a pressure of 0.5-0.8 kPa (5-8 mbar).

Chemical modification

The oil is hydrolyzed by boiling the oil in 6 M NaOH (1:2 W/W) for four hours. The mixture is diluted by addition of an equal amount of water. Concentrated hydrochloric acid is slowly added until the mixture is weakly acidic and then the mixture is cooled to room temperature. The fatty acid (mixture of primarily stearic acid and palmitic acid), which is referred to as stearic acid in the following, is isolated by filtration and recrystallized from methanol.

Lactic acid lactate is prepared by heating lactic acid at 120°C for 10 hours. One equivalent of stearic acid, 1.2 equivalents of lactic acid lactate and ½ equivalent of sodium carbonate are mixed and heated at 200°C for 1.5 hours. The reaction is performed under nitrogen, but the water produced from the reaction is allowed to escape from the reactor. No further purification is necessary.

Example 4

The purpose of the following procedure is to produce an organic emulsifier according to the invention, organic citric acid ester of glyceryl monostearate. The steps of the method according to the invention are described in the following.

Isolation of palm oil

Oil palms *(Elaeis guineensis)* are grown in Malaysia according to the principles of organic production. Thus no pesticides or chemical fertilisers are employed in the production and the highest degree of caution is taken not to disturb the surrounding environment. Furthermore the production is certified as organic by an authorised European organic certification institution.

The fruits contain 35-60% oil, depending on the moisture content. The fresh palm fruits contain very active fat-splitting enzymes (lipases) which must be deactivated as quickly as possible prior to isolating the oil. Since lipases are particularly active in damaged fruits, the whole fruit bunches are sterilised by heating with live steam in autoclaves to deactivate the enzymes and loosen the fruit from the bunches.

The sterilised fruit bunches are threshed in a rotary drum stripper consisting of longitudinal channel bars; the fruits falls through whereas the empty bunch stem is retained in the drum. The separated, sterilised fruit are then converted into an oily mash by a mechanical stirring process known as digestion. The digested fruit mass is passed through screw presses, and the liquor from the press is clarified by static settling or by using decanter centrifuges.

Refinement

The oil is then treated with citric acid and bleaching earth to remove foreign matter and traces of copper and iron compounds. Finally the oil is neutralised by distillation at a temperature of up to 270°C and at a pressure of 0.5-0.8 kPa (5-8 mbar).

Chemical modification

The oil is hydrolyzed by boiling the oil in 6 M NaOH (1:2 W/W) for four hours. The mixture is diluted by addition of an equal amount of water. Concentrated hydrochloric acid is slowly added until the mixture is weakly acidic and then the mixture is cooled to room temperature. The fatty acid (mixture of primarily stearic acid and palmitic acid), which is referred to as stearic acid in the following, is isolated by filtration and recrystallized from methanol.

Glyceryl monostearate is produced by direct esterification. Three equivalents of glycerol are mixed with one equivalent stearic acid and 1% (W/W) concentrated sulfuric acid is added. The mixture is heated at 150°C for four hours. Water produced by the reaction is allowed to escape from the reactor. The mixture is slowly cooled to room temperature. Glyceryl monostearate precipitates and is isolated by filtration.

Equimolar amounts of glyceryl monostearate and citric acid are mixed. 0.3% (W/W) concentrated sulfuric acid is added and the mixture is heated at 175°C for four hours in a nitrogen atmosphere. Water is allowed to escape from the reactor. The product is washed with cold ethanol and dried before use.

Example 5

An organic facial cream according to the invention is prepared according to the following formula.

Chemical description	**% w/w**	**Function**
A		
Water	To 100%	
Organic Sodium stearoyl lactylate*	6,0	Emulsifier
Organic Glycerine (83%)	4,0	Moisturiser

Chemical description	% w/w	Function
B		
Organic Mono-diglyceride*	1,0	Emulsifier/Emollient
Organic Palm Kernel Oil	13,0	Emollient
Organic Glyceryl mono caprylate*	0,5	Preservative
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. B is mixed into A under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 6

An organic facial night cream according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
Organic Glycerine (83%)	4,0	Moisturiser
B		
Organic Isostearyl isostearate*	7,0	Emollient
Organic Decyl oleate*	5,0	Emollient
Organic Stearic acid*	2,0	Emollient
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Oleyl citrate*	3,0	Emulsifier
Organic Sorbitan mono stearate*	6,0	Emulsifier
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. B is mixed into A under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 7

An organic facial moisturiser according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
Organic Glycerine (83%)	4,0	Moisturiser
B		
Organic Isostearyl isostearate*	7,0	Emollient
Beeswax	7,0	Emollient
Organic Myristyl myristate*	5,0	Emollient
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Sucrose cocoate*	4,0	Emulsifier
Organic Sorbitan mono stearate*	5,0	Emulsifier
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. B is mixed into A under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 8

An organic moisturising liquid hand soap according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
Organic Glycerine (83%)	4,0	Moisturiser
Organic Glycol distearate*	2,0	Surfactant
Organic Cocamide MEA*	2,0	Surfactant
B		
Organic Cocamidopropyl betaine*	8,0	Surfactant
Organic Sodium Lauryl sulphate* (27%)	25,0	Surfactant
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are added during cooling starting at 35°C, with mixing in between.

Example 9

An organic facial day cream according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
NaOH	0,5	Neutraliser
Organic Glycerine (83%)	6,0	Moisturiser
B		
Organic Stearic acid*	23,0	Emollient
Organic Wheat germ oil	1,0	Emollient
Organic Isopropyl palmitate*	2,0	Emollient
Organic Glyceryl monocaprylate*	0,5	Preservative
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. B is mixed into A under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 10

An organic general purpose cleansing milk according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Organic Sorbitan stearate*	4,0	Emollient
Organic Decyl myristate*	0,5	Emollient
Organic Peanut oil	6,0	Emollient
Organic Olive oil	10,0	Emollient
B		
Water	To 100%	
Organic Glycerine	4,0	Moisturiser
Urea	4,0	Moisturiser

Chemical description	% in w/w	Function
Organic Glyceryl monocaprylate*	0,5	Preservative
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. A is mixed into B under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 11

An organic facial protective cream according to the invention is prepared according to the following formula.

Chemical description	% w/w	Function
A		
Water	To 100%	
Organic Sodium stearoyl lactylate*	4,5	Emulsifier
Organic Glycerine (83%)	4,0	Moisturiser
Organic Potato starch	1,0	Thickener
B		
Organic Mono-diglycerides*	0,5	Emollient
Organic Palm Kernel Oil	13,0	Emollient
Organic Glyceryl mono caprylate*	0,5	Preservative
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. The ingredients of B are mixed and heated to 70°C. B is mixed into A under constant stirring. The mixture is allowed to cool. At 45°C C is added and the formulation is cooled to room temperature.

Example 11

An organic shampoo according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
Water	To 100%	
Organic Sodium lauryl sulphate* (27%)	20,0	Surfactant
Organic Cocamidopropyl betaine* (30%)	2,0	Surfactant
Citric acid	0,1	Neutraliser
Sodium chloride	1,0	Thickener
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients are dissolved in water one at a time in the written order. A little heat is applied during mixing.

Example 12

An organic "2 in 1" shampoo according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
Water	To 100%	
Organic Sodium lauryl sulphate* (27%)	13,0	Surfactant
Organic Magnesium lauryl sulphate* (20%)	4,0	Surfactant
Organic Cocamidopropyl betaine* (30%)	2,0	Surfactant
Citric acid	0,1	Neutraliser
Sodium chloride	1,0	Thickener
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients are dissolved in water one at a time in the written order. A little heat is applied during mixing.

Example 13

An organic Special Care Shampoo according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
Water	To 100%	
Organic Sodium lauryl sulphate* (27%)	35,0	Surfactant
Organic Glycol distearate*	2,0	Surfactant
Organic Cocamide MEA*	2,0	Surfactant
Organic Cocamidopropyl betaine* (30%)	5,0	Surfactant
Organic Ammonium lauryl sulphate*	8,0	Surfactant
Organic Guar hydroxypropyltrimonium chloride*	0,2	Surfactant
Citric acid	0,05	Neutraliser
Sodium chloride	1,0	Thickener
Organic Glyceryl monocaprylate*	0,5	Preservative
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients are dissolved in water one at a time in the written order. A little heat is applied during mixing.

Example 14

An organic conditioner according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
Organic Cetrimonium chloride*	3,0	Surfactant
Citric acid	0,05	Surfactant
Organic Glyceryl monocaprylate*	0,5	Preservative

B		
Organic Cetearyl alcohol*	2,8	Surfactant
C		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed and heated to 70°C. B is heated to 70°C. B is added to A under stirring. The emulsion is allowed to cool and at 40°C C is added. Cooling is completed.

Example 15

A typical organic lip stick according to the invention is prepared according to the following formula.

Chemical description	**% in w/w**	**Function**
Organic Carnauba wax	4,0	Emollient
Organic Candelilla wax	18,6	Emollient
Organic Lanolin	7,0	Emollient
Organic Polyglycerol ester of dimerised soybean oil*	3,5	Film former
Organic Cetyl alcohol*	3,0	Emollient
Organic Isopropyl myristate*	20,0	Emollient
Organic Castor oil	34,5	Emollient
Organic Glycerol monocaprylate*	0,5	Preservative
Titaniumdioxid	4,0	Color
Red iron oxide	4,5	Color
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients are melted, mixed and poured into the mould, where it is cooled.

Example 16

A typical organic mascara according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
Organic Stearic acid*	23,5	Emollient
Triethanolamine	13,0	Neutraliser
Organic Carnauba wax	8,0	Emollient
Organic Beeswax	28,0	Emollient
Sodium alginate	10,0	For slip and feel
Organic Lanolin	3,0	Emollient
Black iron oxide	10,0	Emollient
Kaolin	4,0	Bulking agent
Organic Glycerol monocaprylate*	0,5	Preservative

*Produced according to the method of the invention

The waxes are melted and the other ingredients added before filling.

Example 17

A typical organic liquid foundation according to the invention is prepared according to the following formula.

Chemical description	% in w/w	Function
A		
Water	To 100%	
Triethanolamine	0,9	Neutraliser
Organic Glycerine	1,0	Moisturiser
Organic Lecithin*	2,0	Pigment wetting agent
B		
Organic Stearic acid*	3,0	Emollient
Organic Propylene glycol monostearate*	1,9	Emulsifier
Organic Lanolin alcohol*	9,5	Emollient
Organic Cetyl palmitate*	1,0	Emollient

Chemical description	% in w/w	Function
Organic Isocetyl stearate*	4,0	Emollient
C		
Kaolin	4,25	Pigment
Titaniumdioxide	6,75	Pigment
Yellow iron oxide	0,6	Pigment
Brown iron oxide	0,8	Pigment
D		
Organic Essential oils	0,4	Fragrance

*Produced according to the method of the invention

The ingredients of A are mixed (without triethanolamine) and heated to 75°C. The ingredients of B are mixed and heated to 75°C. B is added to A, triethanolamine is added and stirred until smooth and homogenous. C and D is added.

Example 18

An organic washing powder according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Organic Sodium lauryl ether sulphate (produced according to the method of the invention): 37.3 % (w/w).
- Polyoxyethylene(8)stearate (produced according to the method of the invention): 25.9 % (w/w).
- Distearyldimethyl ammoniumchloride (produced according to the method of the invention): 2.0 % (w/w).
- Zeolite : 9.2 % (w/w).
- Sodium carbonate: 8.2 % (w/w).
- Moisture: 17.4 % (w/w).

Example 19

An organic washing powder according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Sodium lauryl sulphate (produced according to the method of the invention): 35.3 % (w/w).
- Polyoxyethylene(40)stearate (produced according to the method of the invention): 34.7 % (w/w).
- Zeolite : 8.2 % (w/w).
- Sodium carbonate: 7.2 % (w/w).
- Sodium silicate: 2 % (w/w).
- Moisture: 12.6 % (w/w).

Example 20

An organic washing powder according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Sodium stearyl sulphate (produced according to the method of the invention): 30.4 % (w/w).
- Stearyl benzene sulfonate (produced according to the method of the invention): 28.4 % (w/w).
- Sucrose monolactylate (produced according to the method of the invention): 14.0 % (w/w).
- Sodium carbonate: 10.4 % (w/w).
- Sodium silicate: 4.0 % (w/w).
- Moisture: 13.0 % (w/w).

Example 21

An organic washing-up liquid according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- Sodium lauryl sulphate (produced according to the method of the invention): 25.0 % (w/w).
- Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
- Water: 74.5 % (w/w).

Example 22

An organic washing-up liquid according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- n-dodecylbenzene sulphonate (produced according to the method of the invention): 29.5 % (w/w).
- Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
- Water: 70.0 % (w/w).

Example 23

An organic washing-up liquid according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- n-dodecylbenzene sulphonate (produced according to the method of the invention): 20.0 % (w/w).

Sucrose monolactylate (produced according to the method of the invention): 5.0 % (w/w).
Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
Water: 74.5 % (w/w).

Example 24

An organic household detergent according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water, and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- n-dodecylbenzene sulphonate (produced according to the method of the invention): 15.0 % (w/w).
- n-stearyl sulfonate (produced according to the method of the invention): 5.0 % (w/w).
- Distearyldimethyl ammoniumchloride (produced according to the method of the invention): 2.0 % (w/w).
- Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
- Water: 77.5 % (w/w).

Example 25

An organic household detergent according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- Sodium lauryl ether sulphate (produced according to the method of the invention): 10.0 % (w/w).
- Distearyldimethyl ammoniumchloride (produced according to the method of the invention): 2.0 % (w/w).

- Sucrose monolactylate (produced according to the method of the invention): 10.0 % (w/w).
- Sodium citrate: 0.5 % (w/w).
- Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
- Water: 77.0 % (w/w).

Example 26

An organic household detergent according to the invention is prepared according to the following formula.

The ingredients are slowly added to the water and stirring is continued until a clear homogenous solution is obtained. The product has the following composition:

- Sodium lauryl ether sulphate (produced according to the method of the invention): 15.0 % (w/w).
- Sodium stearate (produced according to the method of the invention): 3 % (w/w).
- Distearyldimethyl ammoniumchloride (produced according to the method of the invention): 2.0 % (w/w).
- Glyceryl monocaprylate (preservative, produced according to the method of the invention): 0.5 % (w/w).
- Water: 79.5 % (w/w).

Washing powder for automatic dishwasher:

Washing powders for automatic dishwasher is produced according to the method of the invention, as shown in the following non-limiting examples:

Example 27

An organic washing powder (for automatic dishwashers) according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Sodium lauryl ether sulphate (produced according to the method of the invention): 37.3 % (w/w).
- Polyoxyethylene(8)stearate (produced according to the method of the invention): 32.9 % (w/w).
- Zeolite : 2.2 % (w/w).
- Phosphates: 11.5 % (w/w).
- Sodium carbonate: 8.2 % (w/w).
- Moisture: 7.9 % (w/w).

Example 28

An organic washing powder (for automatic dishwashers) according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Sodium lauryl sulphate (produced according to the method of the invention): 30.1 (w/w).
- Polyoxyethylene(40)stearate (produced according to the method of the invention): 22.7 % (w/w).
- Sucrose monolactylate (produced according to the method of the invention): 10.4 % (w/w).
- Distearyldimethyl ammoniumchloride (produced according to the method of the invention): 10.4 % (w/w).
- Phosphates: 11.5 % (w/w).
- Zeolite : 8.2 % (w/w).
- Sodium silicate: 1.8 % (w/w).
- Moisture: 9.0 % (w/w).

Example 29

An organic washing powder (for automatic dishwashers) according to the invention is prepared according to the following formula.

The ingredients are mixed in water to obtain a slurry paste. After spraydrying the product has the following composition:

- Sodium lauryl ether sulphate (produced according to the method of the invention): 30.1 (w/w).
- n-dodecylbenzene sulphonate (produced according to the method of the invention): 30.5 % (w/w).
- n-stearyl sulfonate (produced according to the method of the invention): 9.9 % (w/w).
- Phosphates: 19.4 % (w/w).
- Zeolite : 1.0 % (w/w).
- Sodium silicate: 2.1 % (w/w).
- Moisture: 7.0 % (w/w).

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CLAIMS

1. A method of producing an organic surfactant or emulsifier comprising a fatty acid derivative, which method comprises:

(a) isolating an organic oil or fat from an organic source,
(b) optionally refining the isolated organic oil or fat, and
(c) chemically modifying the refined oil or fat to obtain an organic surfactant or emulsifier.

2. A method according to claim 1, wherein the organic oil or fat is isolated from an organically produced plant.

3. A method according to claim 1, wherein the organic oil or fat is isolated from organic milk, isolated from tissue from an organic animal or isolated from an organic egg.

4. A method according to claim 1, wherein the organic oil or fat is isolated from an organically produced microorganism culture, such as a bacterial, a yeast, a fungal, or an algae culture.

5. A method according to any one of claims 1-4, wherein the produced emulsifier or surfactant is an anionic surfactant having the general formula I:

$$R_1\text{-}X_n\text{-}Y\text{-}Z \qquad I$$

wherein R_1 is selected from optionally substituted $C_{6\text{-}30}$-alkyl, optionally substituted $C_{6\text{-}30}$-alkenyl, optionally substituted $C_{6\text{-}30}$-alkyl(aryl), and optionally substituted $C_{6\text{-}30}$-alkoxy;

X is $(CH_2\text{-}CH_2\text{-}O)$;

Y is SO_2, and SO_3;

Z is selected from hydrogen, Na^+, K^+, $½Ca^{++}$, $½Mg^{++}$, and NH_4^+; and

n is 0, 1, 2, 3 or 4.

6. A method according to any one of claims 1-4, wherein the produced emulsifier or surfactant is a non-ionic emulsifier or surfactant having the general formula II:

$$R_2\text{-}X_n\text{-}Z_m\text{-}H \quad II$$

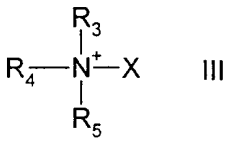
wherein R_2 is selected from optionally substituted $C_{6\text{-}30}$-alkyl, optionally substituted $C_{6\text{-}30}$-alkenyl, optionally substituted $C_{6\text{-}30}$-alkyl(aryl), optionally substituted $C_{6\text{-}30}$-alkoxy, optionally substituted $C_{6\text{-}30}$-alkylcarbonyloxy, optionally substituted $C_{6\text{-}30}$-alkenylcarbonyloxy, optionally substituted $C_{6\text{-}30}$-alkyl(aryloxy), and optionally substituted $C_{6\text{-}30}$-alkylamide;

X is $(CH_2\text{-}CH_2\text{-}O)$;

Z is $(CH_2\text{-}CH(CH_3)\text{-}O)$; and

n is 0-60 and m is 0,3-6 with the proviso that n is 0,3-6 when m is 3-6, and $n+m \geq 1$.

7. A method according to any one of claims 1-4, wherein the produced emulsifier or surfactant is an amphoteric emulsifier or surfactant of the general formula III:



III

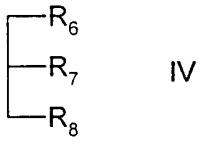
wherein R_3 and R_4 are independently selected from optionally substituted $C_{1\text{-}10}$-alkyl, and optionally substituted $C_{2\text{-}10}$-alkenyl; and

R_5 is selected from optionally substituted $C_{6\text{-}30}$-alkyl, and optionally substituted $C_{6\text{-}30}$-alkenyl; and

X is selected from $C_{1\text{-}30}$-alkyl, oxo, $-CH_2CO_2^-$, $-(CH_2)_3SO_3^-$, and halogen such as fluorine, chlorine, iodine and bromine.

8. A method according to claim 7, wherein the produced emulsifier or surfactant comprises a phospholipid.

9. A method according to any one of claims 1-4, wherein the produced emulsifier or surfactant has the general formula IV:



IV

wherein at least one of R_6, R_7 or R_8 is independently selected from optionally substituted C_{6-30}-alkylcarbonyloxy, and optionally substituted C_{6-30}-alkenylcarbonyloxy;

one of R_6, R_7 or R_8 is independently selected from hydrogen, hydroxyl, $R^{I}C(O)O$-, and $R^{II}OP(OH)(O)O$-, such as ethanoate, 2-hydroxypropanoate, 3,4-dicarboxy-3-hydroxybutanoate, 3-carboxy-2,3-dihydroxypropanoate, 3-carboxy-2-acetyloxy-3-hydroxypropanoate, 3-carboxy-3-acetyloxy-2-hydroxypropanoate, 3-carboxy-2,3-diacetyloxypropanoate;

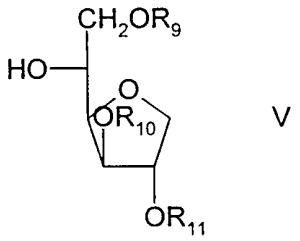
R^{I} is selected from optionally substituted C_{1-30}-alkyl, and optionally substituted C_{2-30}-alkenyl;

R^{II} is selected from hydrogen, ammonium, C_{1-10}-alkyl, amino(C_{1-10}-alkyl), mono-, di- and tri(C_{1-10}-alkyl)amino(C_{1-10}-alkyl); and

the remaining of R_6, R_7 or R_8 is independently selected from hydrogen, hydroxyl, optionally substituted C_{6-30}-alkylcarbonyloxy, optionally substituted C_{6-30}-alkenylcarbonyloxy, and $R^{I}C(O)O$-.

10. A method according to any one of claims 1-4, wherein the produced emulsifier or surfactant comprises a fatty acid ester of a mono- or polysaccharide or the corresponding alcohol of a mono- or polysaccharide.

11. A method according to claim 1 or 10, wherein the produced emulsifier or surfactant has the general formula V:

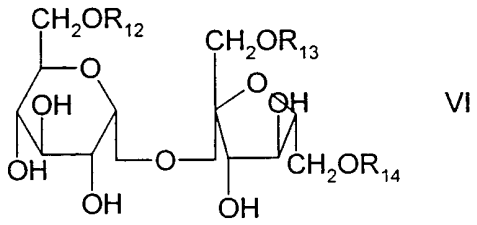


V

wherein one of R_9, R_{10} and R_{11} is independently selected from optionally substituted C_{6-30}-alkylcarbonyl and optionally substituted C_{6-30}-alkenylcarbonyl; and

the remaining of R_9, R_{10} and R_{11} is hydrogen.

12. A method according to claim 1 or 10, wherein the produced emulsifier or surfactant has the general formula VI:



VI

wherein at least one of R_{12}, R_{13} or R_{14} is independently selected from optionally substituted C_{6-30}-alkylcarbonyl, and optionally substituted C_{6-30}-alkenylcarbonyl; and

the remaining of R_{12}, R_{13} and R_{14} are independently selected from hydrogen, optionally substituted C_{6-30}-alkylcarbonyloxy, and optionally substituted C_{6-30}-alkenylcarbonyloxy.

13. A method according to any one of claims 1-12, wherein only natural chemicals or chemicals derived from an organically produced organism are employed.

14. An organic emulsifier or surfactant produced by the method according to any one of claims 1-13.

15. An organic cosmetic composition comprising at least one organic surfactant or emulsifier according to claim 14 and optionally an acceptable vehicle.

16. An organic food composition comprising at least one organic surfactant or emulsifier according to claim 14 and optionally an acceptable vehicle.

17. An organic pharmaceutical composition comprising at least one organic surfactant or emulsifier according to claim 14 and optionally an acceptable vehicle.

18. An organic detergent composition comprising at least one organic surfactant or emulsifier according to claim 14 and optionally an acceptable vehicle.

19. An organic technical composition at least one organic surfactant or emulsifier according to claim 14 and optionally an acceptable vehicle.

20. The use of an organic surfactant or organic emulsifier produced as defined in any one of claims 1-13 in the preparation of an organic cosmetic composition.

21. The use of an organic surfactant or organic emulsifier produced as defined in any one of claims 1-13 in the preparation of an organic food composition.

22. The use of an organic surfactant or organic emulsifier produced as defined in any one of claims 1-13 in the preparation of an organic pharmaceutical composition.

23. The use of an organic surfactant or organic emulsifier produced as defined in any one of claims 1-13 in the preparation of an organic technical composition.

24. The use of an organic surfactant or organic emulsifier produced as defined in any one of claims 1-13 in the preparation of an organic detergent composition.