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EMULSIFYING AGENT AND EMULSIFIED COSMETICS

(13)

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This invention concerns a novel emulsifying agent and emulsified cosmetics using the same.

In the preparation of emulsified cosmetics, combination of higher fatty acid salts and nonionic surfactants have frequently been used as emulsifying agents therefor. However, although the emulsifying agent containing the higher fatty acid salt is excellent for attaining stable emulsification, presence of the higher fatty acid salt increases the pH value to render the cosmetic composition alkaline. By the way, the surfaces of human skins are normally covered with weakly acidic membrane (pH 4.5 - 6.5) and, upon contact with an alkaline substance, acidic substance is secreted to recover normal pH value of the membrane thereby maintaining its weakly acidic condition. Accordingly, it is desired that cosmetics such as creams and milky lotions applied to the skins are conditioned to weakly acidic or neutral pH.

In view of the foregoing, in the preparation of emulsified cosmetics using a higher fatty acid salt as the emulsifying agent, the addition amount of a basic substance (such as sodium hydroxide, potassium hydroxide

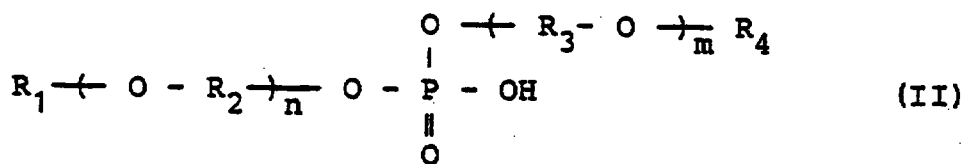
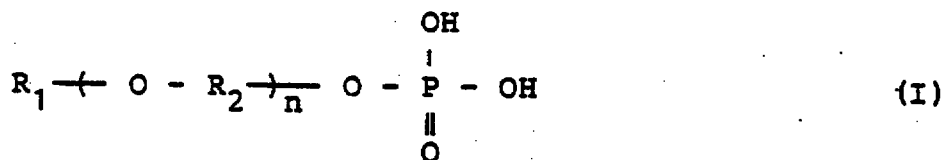
and triethanolamine) used for neutralizing the higher fatty acid has been reduced extremely or an acidic pH buffer such as lactic acid - sodium lactate has been added after the preparation of the emulsified system, in order to reduce the pH value of the cosmetics. However, these methods are defective in that they provide poor emulsified state, which is destroyed with time to cause layer-like separation thereby significantly worsening the appearance of the cosmetics

Further, a higher alcohol sulfate has also been used in place of the higher fatty acid salt but an emulsified system prepared therewith has the defect of excessively irritating the skin, as well as being instable due to gradual hydrolysis of the higher alcohol sulfate with time; although the system is stable under weakly acidic or neutral conditions.

Furthermore, it has also been known that neutral or weakly acidic emulsified cosmetics can be obtained by the use of a nonionic surfactant as the emulsifying agent but, since the nonionic surfactant has only insufficient emulsifying power, it has to be used in a great amount thus causing undesired feelings or the likes in actual use.

Under the above circumstances, the present inventor has made an earnest study for overcoming the foregoing defects, as the result, found that an emulsifying agent consisting of a combination of a partially or completely neutralized product of particular phosphoric acid esters with a basic substance and a particular nonionic surfactant is weakly acidic or neutral in nature, comfortable to human skins and also extremely stable against aging degradation and ~~have~~^{has} accomplished the present invention.

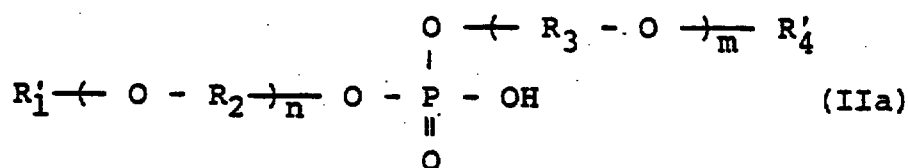
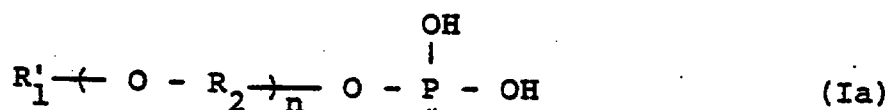
Accordingly, it is a first object of the present invention to provide an emulsifying agent comprising (a) a partially or completely neutralized product, with a basic substance, of a phosphoric acid ester which contains a phosphoric acid monoester represented by the general formula (I) and a phosphoric acid diester represented by the general formula (II) from 100 : 0 to 70 : 30 molar ratio:



wherein R_1 and R_4 represent individually a linear alkyl group or a linear alkenyl group of 10 - 22 carbon atoms or a branched alkyl group of 12 - 24 carbon atoms, R_2 and R_3 represent individually an ethylene group or a propylene group, and m and n represent individually a number of 0 - 30, and (b) a nonionic surfactant with HLB of 6 or less.

The phosphoric acid ester as the starting material for the neutralized product of phosphoric acid ester in this invention can further be classified

[I]



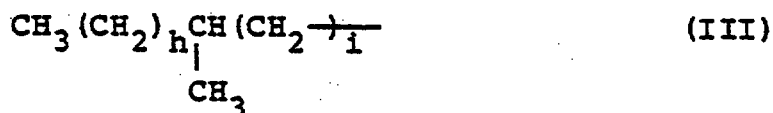
wherein R'_1 and R'_4 represent individually a linear alkyl group or a linear alkenyl group of 10 - 22 carbon atoms and R_2 and R_3 and m and n represent the same meanings as defined above.

Preferred ester residues constituting the phosphoric acid ester [I] include those in which the addition mol number (m, n) of the alkylene oxide is 0, that is, linear alkyl group or linear alkenyl group, with linear alkyl group being particularly preferred. It is required that R'_1 and R'_4 have carbon atoms between 10 - 22. If the carbon atom number is less than 10, it gives not-favorable perfume and provides only poor emulsification. While on the other hand, if the carbon atom number is in excess of 22, crystallization occurs undesirably with time. The carbon atom number of 12 - 18 is particularly preferred

for R_1' and R_4'

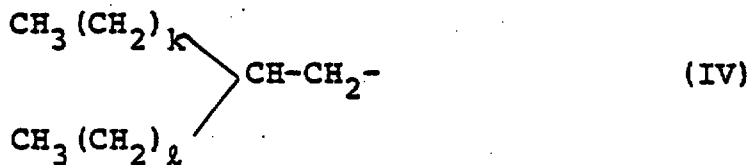
The number of branched chains and the number of carbon atoms contained therein in R_1'' and R_4'' have no particular restriction but those shown below are preferred.

(i) Methyl branched alkyl



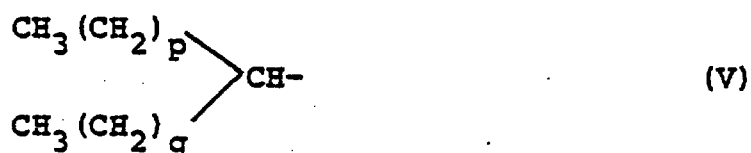
wherein h is a number of 2 - 14, i is a number of 3 - 11 and $h + i$ is a number of 9 - 21, preferably 11 - 19.

(ii) β -branched alkyl



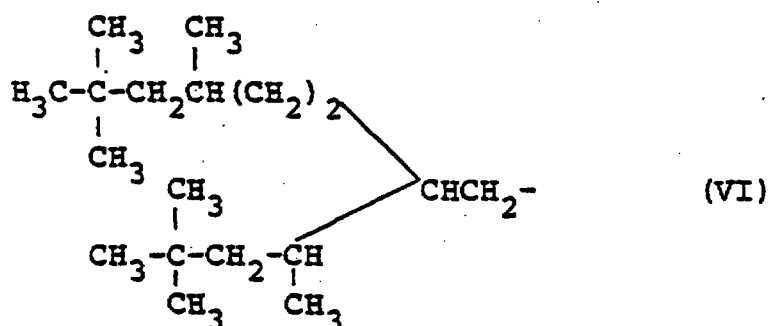
wherein $\underline{k}$ is a number of 5 - 11, $\underline{l}$ is a number of 3 - 10 and $\underline{k} + \underline{l}$ is a number of 8 - 20, preferably 10 - 18.

(iii) α -branched alkyl



wherein $\underline{p}$ is a number of 1 - 20, $\underline{q}$ is a number of 1 - 20 and $\underline{p} + \underline{q}$ is a number of 9 - 21, preferably 11 - 19.

(iv) Multi-branched alkyl group, for example, . .



Among the above branched alkyl groups, those represented by (i) and (ii) are particularly preferred. The alcohol having the group represented by the formula (VI) is commercially available from Nissan Kagaku Kogyo K.K. as Fineoxocol 1800.

The mixing ratio between the phosphoric acid monoester (I) and the phosphoric acid diester (II) is 100 : 0 - 70 : 30 and preferably 100 : 0 - 80 : 20 (in molar ratio). If the phosphoric acid monoester is

less than 70 mol %, it worsens the emulsification, degrades the emulsified state with time to impair the appearance and significantly decrease the consistency of the cosmetics.

The basic substance used for neutralizing the phosphoric acid ester includes alkali metal hydroxide such as sodium hydroxide and potassium hydroxide; basic amino acid such as arginine, ornithine, lysine and oxylysine and alkanol amine having hydroxyalkyl group of 2 or 3 carbon atoms such as triethanolamine, diethanolamine and monoethanolamine, with the basic amino acid being particularly preferred where the phosphoric acid ester represented by the formula (Ia) or (IIa) is used.

The neutralized product of the phosphoric acid ester may be prepared by previously neutralizing a phosphoric acid ingredient with a basic substance ingredient and then blending the neutralized product upon preparation of cosmetics or by blending both of the ingredients individually upon preparation directly in the system, in situ preparation being preferred. Neutralization of the phosphoric acid ester with the basic substance may be carried out completely or partially and, further, the basic substance may be present in excess of the amount required for the neutralization. That is, the amount of the basic substance employed is selected depending on the pH of the aimed

emulsification product and it is, generally, preferred to use 0.2 - 1.8 and, particularly, 0.4 - 1.0 mol of the basic substance per mol of the phosphoric acid ester.

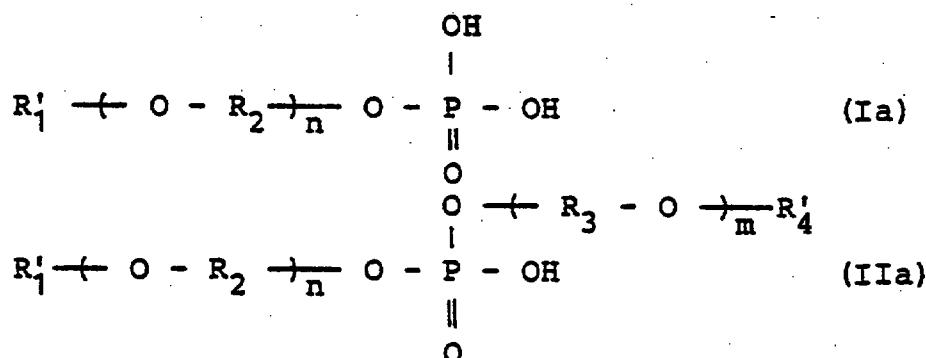
The nonionic surfactant has HLB value of 6 or less, preferably of 2 - 5. The nonionic surfactant includes, for example, polyoxyalkylene alkyl (or alkenyl) ether, polyoxyalkylene alkylphenyl ether, polyoxyalkylene fatty acid ester, polyoxyalkylene glycerin fatty acid ester, polyoxyalkylene sorbitan fatty acid ester, polyoxyalkylene hardened castor oil, polyoxyalkylene alkyl amide (the oxyalkylene moiety being oxyethylene and/or oxypropylene, with oxyethylene being preferred), glycerin fatty acid ester, sorbitan fatty acid ester, sucrose fatty acid ester, polyglycerin fatty acid ester, ethylene or propylene glycol fatty acid ester, fatty acid alkanol amide (the alkyl, alkenyl and fatty acid residues preferably having 8 - 22, particularly, 14 - 18 of carbon atoms). Among them, glycerin fatty acid ester, sorbitan fatty acid ester, sucrose fatty acid ester, polyoxyethylene hardened castor oil, diglycerin fatty acid ester, ethylene or propylene glycol fatty acid ester are preferred. Particularly preferred are glycerin mono-stearate, glycerin mono-isostearate, sorbitan mono-stearate, sorbitan mono-oleate, sorbitan sesqui-oleate, sucrose stearate, propylene glycol mono-stearate, ethylene glycol mono-stearate, diglycerin

22

11

mono-stearate, diglycerin mono-oleate, polyoxyethylene
(1 - 3) mono-stearate ^{and} polyoxyethylene (2 - 10) hardened
castor oil ~~and the like~~

Preferred emulsifying agents comprising the neutral-
ized product of the phosphoric acid ester and the nonionic
surfactant with HLB of 6 or less according to this inven-
tion include, for example, those wherein the component
(a) is neutralized product of the phosphoric acid ester
which contains a phosphoric acid monoester and a phosphoric
acid diester represented by the following formulas in
100 : 0 - 70 : 30 molar ratio:



wherein R'_1 , R_2 , R_3 , R'_4 , m and n have the same meanings as
defined above and the component (b) is a glycerin mono-
fatty acid ester.

Preferred fatty acid for constituting the glycerin
mono-fatty acid ester includes those saturated or unsatu-
rated fatty acids of linear or branched chains having
carbon atoms of 8 - 22 and, in particular, 16 - 20. The
glycerin mono-fatty acid ester used herein may be prepared

by any process and a commercially available mixture consisting of 40 - 100% of glycerin mono-fatty acid ester, 0 - 60% of glycerin di-fatty acid ester and 0 - 10% of glycerin tri-fatty acid ester or the distillation product thereof can be used.

Preferred blending ratio of the glycerin mono-fatty acid ester in the emulsifying agent of the present invention is 0.1 - 20, particularly, 0.3 - 12 times by weight of the neutralized product of the phosphoric acid ester. In the case where the mixture mentioned above is used as the glycerin mono-fatty acid ester, it is blended so that the glycerin mono-fatty acid ester component contained therein lies within the above range.

The emulsifying agent according to the present invention can be used as the emulsifying agent for preparing various emulsion systems. While various processes may be employed for emulsification using this emulsifying agent, a satisfactory result can be obtained, for example, by adding to mix a neutralized product of phosphoric acid ester ~~or phosphoric acid~~ and a nonionic surfactant with HLB of 6 or less into an oily substance, heating to melt (for example at 70 - 80°C), agitating to homogenize and, thereafter, adding warm water or warm aqueous solution of the basic substance under agitation to thereby conduct emulsification. In this case, it is preferred to add the

neutralized product of the phosphoric acid ester in an amount of 0.1 - 5% by weight and, particularly, 0.3 - 3% by weight based on the entire emulsified system. It is particularly preferred to add the phosphoric acid ester and the basic substance individually to the system and then carry out the neutralization in the system.

The emulsifying agent according to the present invention, when used for the preparation of emulsified cosmetics, can provide weakly acidic or neutral emulsified cosmetics stable at a broader pH range and most comfortable to skins giving no undesired irritations, which could not be obtained so far by the use of conventional higher fatty acid ester.

The emulsified cosmetics according to the present invention comprises, as essential components, (a) a neutralized product of phosphoric acid ester, (b) a nonionic surfactant with HLB of 6 or less, (c) an oily substrate and (d) water and, optionally, known cosmetic components such as other surfactant, viscosity controller, pharmaceutical agent, corrosion inhibitor, wetting agent, pigment and perfume incorporated therewith.

The oily substrate usable as the component (c) includes, for example, hydrocarbon such as liquid paraffin, paraffin wax, ceresine and squalene; wax such as bees wax, spermaceti wax, carnauba wax; natural oil and fat of animal

and vegetable origin such as olive oil, tsubaki oil, jojoba oil and lanolin; silicone oil, fatty acid, higher alcohol and ester oils obtained by reacting them.

The surfactant usable herein includes polyoxyethylene alkyl ether, polyoxyethylene fatty acid ester, polyoxyethylene sorbitan fatty acid ester polyoxyethylene sorbitol fatty acid ester, polyoxyethylene hardened castor oil alkyl sulfate, polyoxyethylene alkyl sulfate, alkyl phosphate, polyoxyethylene alkyl phosphate, fatty acid alkali metal salt, sorbitan fatty acid ester and glycerin fatty acid ester, each with HLB 6 or less. and they may be used to such an extent as not impairing the effect of the present invention. The viscosity controller usable herein includes high molecular compound such as polyvinyl alcohol, carboxyvinyl polymer, carboxymethyl cellulose, polyvinyl pyrrolidone, hydroxyethyl cellulose and methyl cellulose; natural gum such as gelatin and tragacant gum; and alcohol such as ethanol and isopropanol. The pharmaceutical agent usable herein includes, for example, sterilizer, antiinflammatory agent and vitamins. The wetting agent usable herein include, for example, propylene glycol, glycerin, 1,3-butylene glycol, sorbitol, lactic acid, sodium lactate and sodium pyrrolidone carboxylate. Further, corrosion inhibitor usable herein includes, for example, paraoxybenzoate, benzoic acid, sodium benzoate, sorbic acid, potassium salt

of sorbic acid and phenoxyethanol.

A preferred composition for the emulsified cosmetics according to this invention is as follows:

	Blending ratio (%)	Particularly preferred blending ratio (%)
Phosphoric acid ester neutralized product (a)	0.1 - 5	0.3 - 3
Nonionic surfactant with HLB 6 or less (b)	0.1 - 20 times by weight of the component (a)	0.3 - 12 times by weight of the component (a)
Oily substrate (c)	1 - 60	5 - 35
Surfactant	0 - 10	0.5 - 7
Viscosity controller	0 - 10	0 - 2
Pharmaceutical agent	0 - 10	
Wetting agent	0 - 30	0 - 10
Corrosion inhibitor	0 - 2	0.02 - 1
Water (d)	25 - 95	40 - 90

The emulsified cosmetics according to the present invention may be made into various forms, for example, vanishing cream, milky lotion, cold cream, cleansing cream, hair cream, foundation cream and hand cream, and they may be prepared into either oil-in-water or water-in-oil type emulsion.

The present invention will now be explained referring to the examples which, however, should not be construed

as limiting the present invention thereto.

Example 1

Emulsified systems having blending compositions as shown in Table 1 were prepared and the emulsified state and the stability thereof were examined. The results are shown in Table 2.

Table I

Component		Composition (%)	
		This invention	Comparative product **
Oil phase	Stearyl phosphate (monoester : diester = 100 : 0)*	1.2	-
	Stearic acid	-	4.0
	Glycerin monostearate	1.8	-
	Ethyleneglycol monostearate	-	2.2
	Polyoxyethylene(20)sorbitan monostearate	-	1.8
	Liquid paraffin	30.0	30.0
Aqueous phase	Triethanolamine	-	1.0
	L-arginine	0.6	-
	Water	66.4	61.0
pH		6.5	6.1

* The mixing ratio is represented by the molar ratio throughout the examples.

** After the emulsification, pH was adjusted to 6.1 by using lactic acid and sodium lactate.

Method of preparation:

The oil phase heated to 70 - 80°C and melted under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification and instantly cooled to a room temperature.

Result:**Table 2**

	Emulsified state just after the emulsification	State left for one month at room temperature
This invention	good	good
Comparative product	good	separated

As can be seen from Table 2, the products according to this invention exhibited better emulsified state and satisfactory stability for the emulsification over a long period when compared with the comparative product which lack at least either one of the phosphoric acid ester and the glycerin mono-fatty acid ester.

Example 2

Weakly oily moisture creams having blending compositions as shown in Table 3 were prepared and the stability for the emulsification and the viscosity were examined for aging changes. The results are shown in Table 4 and Table 5.

Table 3

Component		Composition (%)			
		This invention		Comparative products	
		A	B	C	D
Oil phase	Liquid paraffin	10.0	10.0	10.0	10.0
	Isopropyl palmitate	6.0	6.0	6.0	6.0
	Cetanol	2.0	2.0	2.0	2.0
	Cetyl palmitate	5.0	5.0	5.0	5.0
	Stearyl phosphate (monoester : diester = 100 : 0)	1.2	-	-	-
	Cetyl phosphate (monoester : diester = 80 : 20)	-	1.0	-	-
	Cetyl phosphate (monoester : diester = 50 : 50)	-	-	1.0	1.4
	Glycerin monostearate	1.8	2.0	2.0	1.5
	Butylparaben	0.1	0.1	0.1	0.1
Aqueous phase	Propyleneglycol	5.0	5.0	5.0	5.0
	L-arginine	0.60	0.38	0.40	0.34
	Methylparaben	0.1	0.1	0.1	0.1
	Water	balance	balance	balance	balance
Perfume		trace	trace	trace	trace
Basic substance to phosphoric acid ester molar ratio		1.0	0.8	1.0	0.6
pH		5.8	5.6	7.4	6.0

Method of preparation:

The oil phase was heated to 70 - 80°C and melted uniformly under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification. After cool^{ing} to 50°C, a perfume was added and further cooled to room temperature while stirring to obtain weakly oily moisture cream.

Result:

Table 4

			Emulsified state just after the emulsification	Stability	
				After 4 days	After one month
This invention	A	25°C	good	no change	no change
		40°C	good	no change	no change
	B	25°C	good	no change	no change
		40°C	good	no change	no change
Comparative products	C	25°C	somewhat poor	no change	crystallized
		40°C	somewhat poor	separated	separated
	D	25°C	good	no change	crystallized
		40°C	good	no change	separated

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Table 5

		Viscosity (cPs, 25°C)	
		After 4 days	After one month
This invention	A	52,000	56,000
	B	54,000	54,000
Comparative products	C	61,000	10,000
	D	64,000	32,000

As can be seen from Table 4 and Table 5, the weakly oily moisture creams according to the present invention showed no changes in the viscosity and satisfactory stability for the emulsification over a long period.

Example 3

Nutritive creams having blending compositions as shown in Table 6 (O/W type) were prepared and the emulsified state and the stability thereof were examined. The results are shown in Table 7.

Table 6

Component		Composition (%)	
		This invention	
		E	F
Oil phase	Cetyl 2-ethylhexanoate	10.0	10.0
	Jojoba oil	4.0	4.0
	Liquid lanolin	3.0	3.0
	Vaseline (Registered Trade Mark)	14.0	14.0
	Bees wax	5.0	5.0
	Stearyl phosphate (monoester : diester = 90 : 10)	1.4	-
	Oleyl phosphate (monoester : diester = 80 : 20)	-	1.8
	Glycerin monopalmitate	3.0	3.0
	Butylparaben	0.1	0.1
Aqueous phase	Glycerin	4.0	4.0
	Propyleneglycol	3.0	3.0
	L-arginine	0.52	0.71
	Methylparaben	0.1	0.1
	Water	balance	balance
Perfume		trace	trace
Fatty acid monoglyceride to phosphoric acid ester weight ratio		2.1	1.7
pH		5.7	5.8

Method of preparation:

The creams were prepared in the procedures similar to Example 1.

Result:

Table 7

		Emulsified state	Stability (after 3 month's leaving at room temperature)
This invention	A	good	no change
	B	good	no change

As can be seen from Table 7, the nutritive creams according to the present invention (O/W type) showed satisfactory emulsified state and good stability for the emulsification over a long time.

Example 4

Nutritive milky lotions having blending compositions as shown in Table 8 (O/W type) were prepared, and the emulsified state and the stability thereof were examined. The results are shown in Table 9.

Table 8

Component		Composition (%)	
		This invention	
		I	J
Oil phase	Squalene	10.0	10.0
	Vaselin	2.0	2.0
	Liquid lanolin	2.0	2.0
	Cetyl palmitate	4.0	4.0
	Cetyl phosphate (monoester : diester = 100 : 0)	0.8	0.4
	Glycerin monostearate	1.6	1.2
	Butylparaben	0.1	1.0
Aqueous phase	Propyleneglycol	5.0	5.0
	L-arginine	0.40	-
	L-lysine	-	0.20
	Methylparaben	0.1	0.1
	Water	balance	balance
	Perfume	trace	trace
pH		5.7	6.1

Method of preparation:

The milky lotions were prepared in the procedures similar to Example 1.

Result:

Table 9

		Emulsified state	Stability (after 3 months's leaving at room temperature)
This invention	I	good	no change
	J	good	no change

As can be seen from Table 9, the nutritive milky lotions according to the present invention (O/W type) showed satisfactory emulsified state and good stability for the emulsification over a long time.

Example 5 Cold cream (O/W type):

Composition:

(Oil phase)

Vaselin	25.0%
Liquid paraffin	18.0
Bees wax	3.0
Cetanol	3.0

Cetyl phosphate (monoester : diester = 100 : 0)	0.6%
Myristyl phosphate (monoester : diester = 100 : 0)	0.4
Monoglycerin stearate	2.0
Butylparaben	0.1
(Aqueous phase)	
Propyleneglycol	4.0
L-arginine	0.45
Methylparaben	0.1
Water	balance
(Perfume)	trace

Method of preparation:

The cream was prepared in the procedures similar to Example 1.

Example 6 Nutritive cream (W/O type):

Composition:

(Oil phase)

Liquid paraffin	20.0%
Vaselin	12.0
Bees wax	6.0
Cetyl palmitate	5.0
Liquid lanolin	6.0
Oleyl phosphate (monoester : diester = 80 : 20)	0.6
Monoglycerin oleate	3.6



(Aqueous phase)

Propyleneglycol	3.0%
Sodium benzoate	0.5
L-arginine	0.20
Water	balance

(Perfume)

trace

Method of preparation:

The oil phase was heated to 70 - 80°C and uniformly melted under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification. After cooled ^{ing} to 50°C, a perfume was added and further cooled to 30 - 35°C while stirring. Thereafter, they were further processed and sufficiently emulsified in homogenizer to obtain nutritive cream.

Example 7 Foundation cream (O/W type):

Composition:

(Oil phase)

Liquid paraffin	10.0%
Isopropyl myristate	3.0
Solid paraffin	2.0
Cetanol	1.0
Stearyl phosphate (monoester : diester = 100 : 0)	0.8
Monoglycerin stearate	1.6
Butylparaben	0.1

(Aqueous phase)

Propyleneglycol	5.0%
L-arginine	0.40
Montmorillonite	1.0
Titanium oxide	7.0
Talc	5.0
Iron oxide	3.0
Methylparaben	0.1
Water	balance

(Perfume)

trace

Method of preparation:

The oil phase was heated to melt at 75 - 80°C and then uniformly mixed under agitation. While on the other hand, the aqueous phase was heated to dissolve at 70 - 75°C and, after uniformly dispersing the powder by a dispersing machine, they were added to the oil phase for reaction into emulsification. After cooled^{ing} to 50°C under agitation, a perfume was added, further cooled to 30 - 40°C and then processed and sufficiently emulsified on a homogenizer to obtain foundation cream.

Example 8

For the weakly oily moisture cream A obtained Example 2, the emulsified state and the stability thereof against the aging changes were examined while varying the blending

(40)

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ratio of the basic substance form 0 to 2.2 (in molar ratio) to the phosphoric acid ester (stearyl mono-phosphate). The results are as shown in Table 10. The symbols used in the Table means: "extremely good" by $\odot$, "good" by $\bigcirc$ and "somewhat poor" by $\triangle$.

Table 10

L-arginine to phosphoric acid ester molar ratio	pH	Emulsified state	Stability for emulsification	
			Room temperature after 3 months	40°C after 3 months
0	-	immediately separated	-	-
0.1	-	$\triangle$	$\triangle$	separated
0.4	5.6	$\odot$	$\odot$	$\odot$
1.0	6.2	$\odot$	$\odot$	$\odot$
1.8	6.7	$\bigcirc$	$\bigcirc$	$\triangle$
2.2	-	immediately separated	-	-

As can be seen from Table 10, moisture creams in which the molar ratio of L-arginine to the phosphoric acid ester is in the range from 0.2 to 2.0 were weakly acidic cream and satisfactory both in the emulsified state and the stability, different from those creams wherein the molar ratio is not within the range.

Example 9

Functional test was effected by 10 expert panelers

for the feeling in use with respect to the weakly oily moisture cream A in Example 2, and the nutritive cream (O/W type) E in Example 3 as the products according to the present invention, two types of comparative products P and Q having the blending compositions as shown in Table 11 and a commercially available nutritive cream R shown in Table 11, that is, five specimens in total. The results are shown in Table 12.

Table 11

Component		Composition (%)	
		P	Q
Oil phase	Liquid paraffin	10.0	10.0
	Isopropyl palmitate	6.0	6.0
	Cetanol	2.0	2.0
	Cetyl palmitate	5.0	5.0
	Stearic acid	2.0	-
	Glycerin monostearate	1.8	3.0
	Butylparaben	0.1	0.1
Aqueous phase	Propyleneglycol	5.0	5.0
	Sodium dodecyl sulfate	-	0.6
	Triethanolamine	1.0	-
	Methylparaben	0.1	0.1
	Water	balance	balance
Perfume		trace	trace

Method of preparation:

The creams were prepared in the procedures similar to Example 2.

Result:

Table 12

		Extendability	Affinity to skin	Stickiness	Appearance
This invention	A	+1.4	+1.8	-1.6	+1.4
	E	+0.6	+1.4	-1.2	+1.4
Comparative products	P	-0.8	-0.2	-0.4	+1.0
	Q	+0.4	-0.8	+0.2	+0.6
	R (commercial product)	-1.2	-1.0	+1.4	+0.2

(The values are averaged values for 10 persons⁻³)

(Estimation standard)

	Extendability	Affinity to skin	Stickiness	Appearance
+2	extremely good	extremely good	extremely strong	extremely good
+1	fair	fair	strong	fair
0	usual	usual	usual	usual
-1	poor	poor	weak	poor
-2	extremely poor	extremely poor	extremely weak	extremely poor

Example 10

The emulsified systems having blending compositions as shown in Table 13 were prepared, and the emulsified state and the stability thereof were examined. The results are shown in Table 14.

Table 13

Component		Composition (%)		
		This invention	Comparative products	
			1	2**
Oil phase	Isostearyl phosphate (monoester : diester = 100 : 0)*	1.2	1.2	-
	Stearic acid	-	-	4.0
	Sorbitan monostearate (HLB 4.7)	2.0	-	2.2
	Polyoxyethylene(20) sorbitan monostearate (HLB 14.9)	-	2.0	1.2
	Liquid paraffin	30.0	30.0	30.0
Aqueous phase	Triethanolamine	-	-	1.0
	L-arginine	0.6	0.6	-
	Water	66.2	66.2	61.6
pH		6.5	-	6.1

* The mixing ratio is represented by the molar ratio.

** The comparative product 2 was prepared by adding lactic acid/sodium lactate after the emulsification to adjust the pH to ^{the} weakly acidic range.

Method of preparation:

The oil phase was heated to 70 - 80°C and melted under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification and instantly cooled to a room temperature.

Table 14

		Emulsified state just after the emulsification	State after leaving one month at room temperature
This invention		good	good
Comparative products	1	separated	-
	2	good	separated

Example 11

Moisture creams having blending compositions as shown in Table 15 were prepared and the aging changes for the stabilization of the emulsification and the viscosity were examined. The results are shown in Table 16 and Table 17.

Table 15

Component		Composition (%)			
		This Invention		Comparative products	
		S	T	U	V
Oil phase	Vaselin	6.0	6.0	6.0	6.0
	2-octyldodecyl myristate	10.0	10.0	10.0	10.0
	Cetanol	2.0	2.0	2.0	2.0
	Cetyl palmitate	6.0	6.0	6.0	6.0
	Isostearyl phosphate*	1.0	-	-	-
	Isocetyl phosphate**	-	1.2	-	-
	Isostearyl phosphate***	-	-	1.0	1.6
	Glycerin monostearate (HLB 3.5)	2.2	3.0	2.2	3.0
	Butylparaben	0.1	0.1	0.1	0.1
Aqueous phase	Glycerin	5.0	5.0	5.0	5.0
	Sodium hydroxide	0.091	0.123	0.072	0.072
	Methylparaben	0.1	0.1	0.1	0.1
	Water	balance	balance	balance	balance
Perfume		trace	trace	trace	trace
Basic material to phosphoric acid ester molar ratio		0.8	0.9	0.8	0.5
Emulsified state (just after emulsification)		good	good	poor	somewhat poor
pH		5.9	6.2	7.6	6.2

- * Essentially comprising those having monoester : diester ratio = 100 : 0 and branched chain configuration in the form of a methyl branched alkyl represented by the formula (III) with $i = 9$.
- ** Essentially comprising those having monoester : diester ratio = 80 : 20 and branched chain configuration in the form of a β -branched alkyl represented by the formula (IV) with $k = 5$ and $l = 7$.
- *** Comprising those having monoester : diester = 50 : 50 and branched chain configuration in the form of a methyl branched alkyl represented by the formula (III).

Method of preparation:

The oil phase was heated to 70 - 80°C and melted uniformly under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification. After cooled^{ing} to 50°C, a perfume was added and further cooled to room temperature while stirring to obtain moisture creams.

Table 16

			Stability for emulsification	
			after one week	after two months
This invention	S	25°C	no change	no change
		40°C	"	"
	T	25°C	"	"
		40°C	"	"
Comparative products	U	25°C	partially separated	separated
		40°C	separated	separated
	V	25°C	no change	partially separated
		40°C	partially separated	separated

Table 17

		Viscosity (cPs, 25°C)	
		after one week	after two months
This invention	S	63,000	66,000
	T	44,000	42,000
Comparative products	U	47,000	-
	V	40,000	31,000

As can be seen from Table 16 and Table 17, the products according to this invention S, T wherein the phosphoric acid monoester and phosphoric acid diester are within the range of 100 : 0 - 70 : 30 molar ratio gave good results.

Example 12

Nutritive creams (O/W type) having blending compositions as shown in Table 18 were prepared and the emulsified state and the stabilization for emulsification were examined. The results are shown in Table 19.

Table 18

Component		Composition (%)	
		This invention	
		W	X
Oil phase	2-octyldodecyl myristate	10.0	10.0
	Jojoba oil	4.0	4.0
	Liquid lanolin	3.0	3.0
	Vaselin	14.0	14.0
	Bees wax	5.0	5.0
	Isostearyl phosphate*	0.8	1.0
	Sorbitan monostearate (HLB 4.7)	2.4	2.5
	Polyoxyethylene (20) sorbitan monostearate (HLB14.9)	0.4	-
	Butylparaben	0.1	0.1
Aqueous phase	Glycerin	3.0	3.0
	Propylene glycol	4.0	4.0
	Potassium hydroxide	-	0.14
	L-arginine	0.34	-
	Methylparaben	0.1	0.1
	Water	balance	balance
Perfume		trace	trace
Oleophilic nonionic surfactant to phosphoric acid ester weight ratio		3.0	2.5
pH		6.0	6.4

- * Comprising those having monoester : diester ratio = 90 : 10 and branched chain configuration in the form of a methyl branched alkyl represented by the formula (III).

Method of preparation:

The creams were prepared in the procedures similar to Example 11.

Result:

Table 19

		Emulsified state	Stability for emulsification (after 3 months's leaving at room temperature)
This invention	W	good	no change
	X	good	no change

As can be seen from Table 19, the products according to the present invention (W, X) in which the weight ratio of oleophilic nonionic surfactant to phosphoric acid ester is in the range of 0.1 - 20 gave good results.

Example 13

Nutritive milky lotions (O/W type) having blending compositions as shown in Table 20 were prepared and the

emulsified state and the stability for emulsification examined. The results are shown in Table 21.

Table 20

Component		Composition %	
		This invention	
		A	B
Oil phase	Squalene	10.0	10.0
	Vaselin	2.0	2.0
	Liquid lanolin	2.0	2.0
	Cetyl palmitate	4.0	4.0
	Isocetyl phosphate*	0.8	0.4
	Glycerin monostearate (HLB 3.5)	1.6	1.2
	Butylparaben	0.1	1.0
Aqueous phase	Propylene glycol	5.0	5.0
	L-arginine	0.40	-
	Sodium hydroxide	-	0.04
	Methylparaben	0.1	0.1
	Water	balance	balance
Perfume		trace	trace
pH		5.9	6.4

- * Essentially comprising those having monoester :
diester ratio = 100 : 0 and branched chain configuration in the form of a β -branched alkyl represented by the formula (IV) with $k = 5$ and $l = 7$.

Method of preparation:

Milky lotions were prepared in the procedures similar to Example 11.

Result:

Table 21

		Emulsified state	Stability for emulsification (after 3 months's leaving at room temperature)
This invention	A	good	no change
	B	good	no change

As can be seen from Table 21, the products according to the present invention in which phosphoric acid ester is contained within a range of 0.1 - 5% gave good results.

Example 14

The nutritive creams (W/O type) having blending compositions as shown in Table 22 were prepared and the emulsified state and the stability for emulsification were examined. The results are shown in Table 23.

Table 22

Component		Composition (X)	
		This invention	Comparative Products
		E	F
Oil phase	Vaselin	18.0	18.0
	Liquid paraffin	14.0	14.0
	Bees wax	4.0	4.0
	Liquid lanolin	8.0	8.0
	Cetyl palmitate	4.0	4.0
	Isostearyl phosphate*	0.5	-
	Sorbitan sesquioleate (HLB 3.7)	3.5	4.2
Aqueous phase	Propylene glycol	3.0	3.0
	Sodium benzoate	0.5	0.5
	L-arginine	0.20	0.2
	Water	balance	balance
Perfume		trace	trace

* Essentially comprising those having monoester : diester ratio = 80 : 20 and branched chain configuration in the form of a β -branched alkyl represented by the formula (IV) with $k = 6$ and $l = 8$.

Method of preparation:

The oil phase was heated to 70 - 80°C and uniformly melted under agitation. The aqueous phase heated to dissolve at 70 - 80°C under agitation was added to conduct emulsification. After cooled^{ing} to 50°C, a perfume was added and further cooled to 30 - 35°C while stirring. Thereafter, they were further processed and sufficiently emulsified in a homogenizer to obtain nutritive creams.

Result:

Table 23

		Emulsified state	Stability for emulsification (after one month leaving)		
			-5°C	room temperature	40°C
This invention	E	good	no change	no change	no change
Comparative product	F	good	partially separated	no change	separated

As can be seen from Table 23, the product according to this invention exhibited better stability for emulsification against temperature change as compared with comparative product.

Example 15 Cold cream:

Composition:

(Oil phase)

Liquid paraffin

25.0%

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Vaselin	18.0%
Bees wax	2.0
Cetanol	3.0
Isocetyl phosphate (same as the phosphoric acid ester* in Table 20)	1.0
Sorbitan mono-oleate (HLB 4.3)	2.0
Butylparaben	0.1
(Aqueous phase)	
□ Propylene glycol	4.0
Sodium hydroxide	0.12
Methylparaben	0.1
Water	balance
(Perfume)	trace

Method of preparation:

The creams were prepared in the procedures similar to Example 11.

Example 16 Foundation Cream:

Composition:

(Oil phase)

Squalene	10.0%
Isopropyl palmitate	3.0
Cetyl palmitate	3.0
Isostearyl phosphate (same as the phosphoric acid ester* in Table 15)	1.0



Glycerin mono-stearate (HLB 3.5)	2.0%
Butylparaben	0.1
(Aqueous phase)	
Propylene glycol	5.0%
Potassium hydroxide	0.13
Montmorillonite	1.0
Titanium oxide	7.0
Talc	5.0
Iron oxide	3.0
Methylparaben	0.1
Water	balance
(Perfume)	trace

Method of preparation:

The oil phase was heated to melt at 75 - 80°C and uniformly mixed under agitation. While on the other hand, the aqueous phase was heated to dissolve at 70 - 75°C. After uniformly dispersing the powder in a dispersing machine, the oil phase was added and reacted to conduct emulsification. After cooled^{-ing} to 50°C while stirring, a perfume was added, further cooled to 30 - 40°C and then processed and sufficiently emulsified in a homogenizer to obtain foundation cream.

Example 17

S

For the moisture cream Δ in Table 15 of Example 11, the emulsified state, the stabilization for emulsification and the changes in physical properties therefor were examined while varying the blending ratio (molar ratio) of the basic substance (sodium hydroxide) to phosphoric acid ester from 0.05 to 2.0. The results are as shown in Table 24. The symbols used in the Table mean "extremely good" by $\odot$, "good" by $\bigcirc$ and "somewhat poor" by Δ .

Table 24

Sodium hydroxide to phosphoric acid ester molar ratio	pH	Emulsified state	Stabilization for emulsification		Viscosity (cps)	
			after three months at room temperature	after three months at 40°C	after one week at 25°C	after two months at 25°C
0.05	-	immediately separated	-	-	-	-
0.2	5.1	○	○	△	52,000	39,000
0.5	5.9	⊙	⊙	⊙	56,000	60,000
0.8	6.3	⊙	⊙	⊙	63,000	66,000
1.4	7.0	○	○	△	44,000	32,000
2.0	-	immediately separated	-	-	-	-

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As can be seen from Table 24, in the case where the sodium hydroxide to phosphoric acid ester molar ratio is within a range of 0.2 - 1.4, the moisture cream prepared is neutral or weakly acidicⁱⁿ nature. Particularly, when the above molar ratio is within a range of 0.5 - 0.8, the aging changes in the viscosity is low and the stability for emulsification is satisfactory.

Example 18

A functional test was conducted by 10 expert panelers for the feelings in actual use of the moisture cream S in Example 11 and the nutritive milky lotion A in Example 13 as the products according to this invention, the moisture creams G, H as comparative products and the nutritive milky lotion I as commercial products shown in Table 25, that, for 5 specimens in total. The results are shown in Table 26.

Table 25

Component		Composition (%)	
		Comparative product	
		G	H
Oil phase	Vaselin	6.0	6.0
	2-octyldodecyl myristate	10.0	10.0
	Cetanol	2.0	2.0
	Cetyl palmitate	6.0	6.0
	Stearic acid	2.0	-
	Glycerin monostearate	2.0	3.0
	Butylparaben	0.1	0.1
Aqueous phase	Glycerin	5.0	5.0
	Sodium cetyl sulfate	-	0.6
	Triethanolamine	1.0	-
	Methylparaben	0.1	0.1
	Water	balance	balance
Perfume		trace	trace

Method of preparation :

The preparation procedures were the same as in Example 11.

Table 26

Specimen		Appearance	Extendability	Affinity to skin	Stickiness
This invention	S (Moisture cream)	+1.6	+1.0	+1.8	-1.2
	A (Nutritive milky lotion)	+1.8	+2.0	+1.6	-1.8
Comparative products	G (Moisture cream)	+1.2	+0.4	-1.2	+1.0
	H (Moisture cream)	+0.2	-1.0	-1.4	+1.4
	I (Commercial Nutritive milky lotion)	+1.4	+1.6	+0.4	-0.8

(The values are averaged values for 10 persons)

(Estimation standard)

	Appearance, Extendability, Affinity to skin	Stickiness
+2	extremely good	extremely strong
+1	good	rather strong
0	usual	usual
-1	somewhat poor	weak
-2	poor	extremely weak

As can be seen from Table 26, the specimens S and A as the products according to this invention exhibited good affinity to human skins and less stickiness and gave good results.

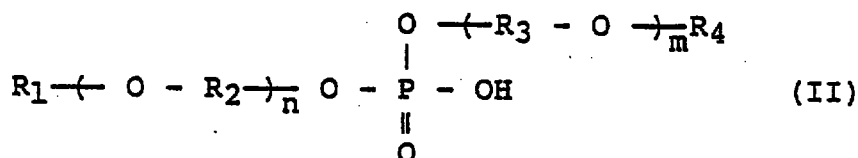
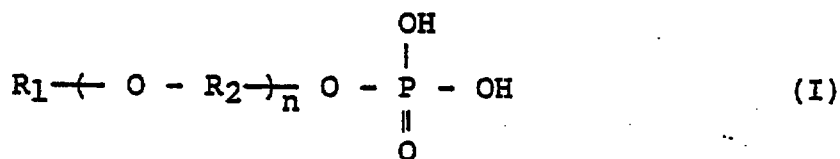


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Claims:

1. An emulsifying agent comprising

(a) a partially or completely neutralized product, with a basic substance, of a phosphoric acid ester which contains a phosphoric acid monoester represented by the general formula (I) and a phosphoric acid diester represented by the general formula (II) from 100 : 0 to 70 : 30 molar ratio:



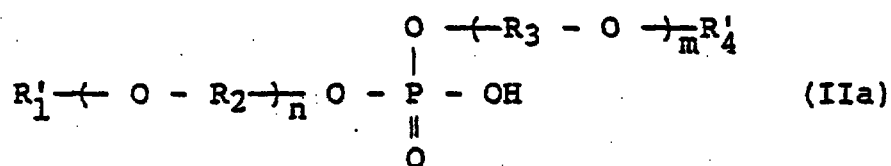
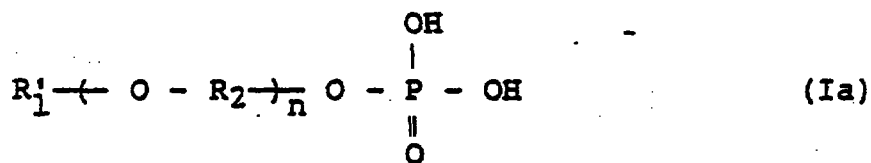
wherein R₁ and R₄ represent individually a linear alkyl group or a linear alkenyl group of 10 to 22 carbon atoms or a branched alkyl group of 12 to 24 carbon atoms, R₂ and R₃ represent individually an ethylene group or a propylene group, and m and n represent individually a number of 0 to 30, and

(b) a nonionic surfactant with hydrophilic/ lipophilic balance (HLB) of 6 or less.



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2. The emulsifying agent according to claim 1, wherein the component (b) is incorporated in ratio of 0.5 to 12 times the amount of component (a).
3. The emulsifying agent according to claim 1 or 2 which contains 0.2 to 1.8 mol of the basic substance per 1 mol of the phosphoric acid ester.
4. The emulsifying agent according to any preceeding claim wherein the component (b) is a glycerin mono-fatty acid ester.
5. The emulsifying agent according to any preceeding claim wherein the component (a) is a partially or completely neutralized product, with a basic substance, of a phosphoric acid ester which contains a phosphoric acid monoester represented by the general formula (Ia) and a phosphoric acid diester represented by the general formula (IIa) from 100 : 0 to 70 : 30 molar ratio:





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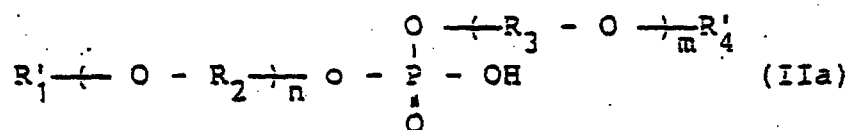
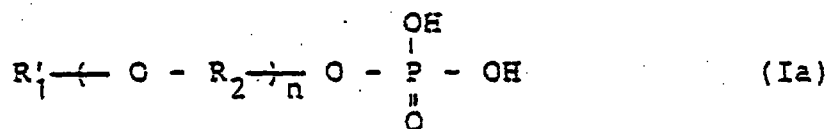
wherein R_1' and R_4' represent individually a linear alkyl group or a linear alkenyl group of 10 to 22 carbon atoms, R_2 and R_3 represent individually an ethylene group or a propylene group and m and n represent individually a number of 0 to 30, and the component (b) is a glycerin mono-fatty acid ester.

6. An emulsified cosmetic according to Claim 1 and substantially as hereinbefore set forth with reference to the foregoing examples.



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represented by the general formula (IIa) from 100 : 0 to 70 : 30 molar ratio:



wherein R_1' and R_4' represent individually a linear alkyl group or a linear alkenyl group of 10 - 22 carbon atoms, R_2 and R_3 represent individually an ethylene group or a propylene group, and m and n represent individually a number of 0 - 30, and the component (b) is a glycerin mono-fatty acid ester.

8. The emulsified cosmetics according to claim 5, comprising the component (a) of 0.1 - 5% by weight, the component (b) of 0.1 - 20 times by weight of the component (a), the component (c) of 1 - 60% by weight and the component (d) of 25 - 95% by weight.



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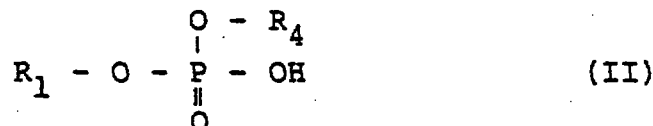
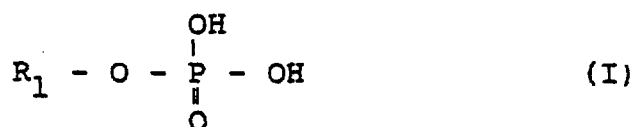
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Claims

1. An emulsifying agent comprising

(a) a partially or completely neutralized product, with a basic substance, of a phosphoric acid ester which contains a phosphoric acid monoester represented by the general formula (I) and a phosphoric acid diester represented by the general formula (II) from 100 : 0 to 70 : 30 molar ratio:



wherein R_1 and R_4 represent individually a linear alkyl group or a linear alkenyl group of 10 - 22 carbon atoms or a branched alkyl group of 12 - 24 carbon atoms, and

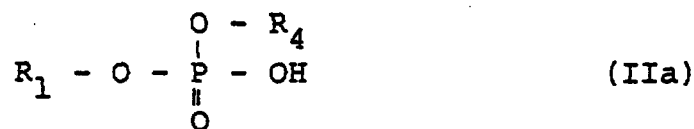
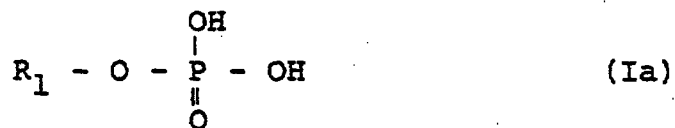
(b) a nonionic surfactant with HLB of 6 or less.

2. The emulsifying agent according to claim 1, wherein the component (b) is a glycerin mono-fatty acid ester.



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3. The emulsifying agent according to claim 1, wherein the component (a) is a partially or completely neutralized product, with a basic substance, or a phosphoric acid ester which contains a phosphoric acid monoester represented by the general formula (Ia) and a phosphoric acid diester represented by the general formula (IIa) from 100 : 0 to 70 : 30 molar ratio:



wherein R'₁ and R'₄ represent individually a linear alkyl group or a linear alkenyl group of 10 - 22 carbon atoms, and the component (b) is a glycerin mono-fatty acid ester.

4. The emulsifying agent according to claim 1, wherein contains 0.2 - 1.8 mol of the basic substance per 1 mol of the phosphoric acid ester.

5. An emulsifying agent as claimed in claim 1 and substantially as described in any one of the specific examples hereinbefore set forth.
