

【DESCRIPTION】

【Invention Title】

UV-BLOCKING COSMETIC COMPOSITION HAVING IMPROVED
SEBUM ABSORPTION ABILITY

【Technical Field】

The present disclosure relates to a sebum-controlling cosmetic composition.

Cross-Reference to Related Application

The present application claims priority to Korean Patent Application No. 10-2019-0057114 filed on May 15, 2019 in the Republic of Korea, the disclosures of which are incorporated herein by reference.

【Background Art】

Sebum is secretion discharged from the sebaceous glands and includes cholesterol, fatty acids and ester compounds. Sebum functions to prevent drying of the skin surface but may cause glittering or make-up stains on the face. Thus, many studies have been conducted about products capable of controlling skin sebum amount in order to maintain a matte and smooth application state all day, in the case of a sunscreen or make-up composition. To control skin sebum amount, non-porous powder or porous spherical powder has been used frequently. Non-porous spherical powder shows low sebum-

absorbing ability. In the case of porous powder particles, sebum-absorbing ability is high by virtue of a high intrusion volume. However, such porous powder particles have an excessively large surface area, resulting in a high possibility of dissolution of ingredients stabilized in a particle matrix. In addition, such porous powder particles have lower mechanical properties as compared to non-porous particles to cause the problem of breakage of particles during a mixing process (homo-mixing, high-pressure emulsifier, or the like).

【Disclosure】

【Technical Problem】

A technical problem to be solved by the present disclosure is to provide a cosmetic composition comprising microparticles which has improved sebum-absorbing ability and high durability and can be dispersed stably in a water-in-oil type or water-in-silicone type cosmetic composition.

【Technical Solution】

In one general aspect, there is provided a composition for improving the sebum-controlling ability of a sunscreen which comprises bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed.

【Advantageous Effects】

According to the embodiments of the present disclosure, the cosmetic

composition according to the present disclosure comprises bis-ethylhexyloxyphenol methoxyphenyl triazine in the form of bowl-like microparticles, and thus can provide a cosmetic composition having high sebum-absorbing ability. The microparticles disperse bis-ethylhexyloxyphenol methoxyphenyl triazine stably in a water-in-oil type or water-in-silicone type cosmetic composition, and provides a light and fresh feeling of use through sebum-controlling ability even after a long time from skin application. In addition, the microparticles cause little greasy feeling and stickiness after skin application by virtue of sebum absorption, and thus can prevent adsorption of fine dust on the skin.

【Brief Description of Drawings】

FIG. 1A is a photographic image illustrating bowl-like microparticles according to an embodiment of the present disclosure.

FIG. 1B is a photographic image of the bowl-like microparticles of FIG. 1A, as taken at a high magnification.

FIG. 1C is a photographic image illustrating porous spherical polymethyl methacrylate (PMMA) particles as a comparative example of the present disclosure.

FIG. 1D is a photographic image of the porous spherical PMMA particles of FIG. 1C, as taken at a high magnification.

FIG. 1E is a photographic image illustrating non-porous spherical PMMA particles as a comparative example of the present disclosure.

FIG. 1F is a photographic image of the non-porous spherical PMMA

particles of FIG. 1E, as taken at a high magnification.

FIG. 2 shows the results of evaluation for a feeling of use upon the application of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure and a composition comprising a different type of powder to the skin.

FIG. 3 shows the results of evaluation for a feeling of use, after the application and absorption of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure and a composition comprising a different type of powder to the skin.

FIG. 4 shows the results of more detailed evaluation for a feeling of use upon the application of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure and a composition comprising a different type of powder to the skin.

FIG. 5 shows the results of more detailed evaluation for a feeling of use, after the application and absorption of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure and a composition comprising a different type of powder to the skin.

FIG. 6 illustrates the results of determination of fine dust-protecting ability of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure.

FIG. 7 illustrates the results of determination of fine dust-protecting ability of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure, in comparison with before using the composition.

FIG. 8 illustrates the results of determination of fine dust-protecting ability of the composition comprising bowl-like microparticles according to an embodiment of the present disclosure, in comparison with right after using the composition.

【Best Mode】

Exemplary embodiments now will be described more fully hereinafter with reference to the accompanying drawings. This disclosure may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth therein. It will be apparent that these exemplary embodiments are provided so that the present disclosure will be complete and understood easily by those skilled in the art. In addition, it will be apparent to those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the disclosure as defined in the following claims.

In one aspect, there is provided a composition for improving a sebum-controlling ability of a sunscreen. The composition may comprise bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed, as an active ingredient. Herein, the bis-ethylhexyloxyphenol methoxyphenyl triazine is not crosslinked into the polymer matrix, particularly polymeric crosslinked structure, but is dispersed homogeneously in a form near molecular units.

In another aspect, there is provided use of bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol

methoxyphenyl triazine is dispersed for preparation of a composition for improving the sebum-controlling ability of a sunscreen. In still another aspect, there is provided a method for improving the sebum-controlling ability of a sunscreen, comprising administering an effective amount of bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed to a subject in need thereof. In still another aspect, there are provided bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed, as an active ingredient for use in a composition for improving the sebum-controlling ability of a sunscreen. In still another aspect, there are provided bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed for use in improvement of the sebum-controlling ability of a sunscreen. In yet another aspect, there is provided non-therapeutic use of bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed, as an active ingredient for improving the sebum-controlling ability of a sunscreen.

Bis-ethylhexyloxyphenol methoxyphenyl triazine is also referred to as another chemical name of 2,4-bis[4-(2-ethylhexyloxy)-2-hydroxyphenyl]-6-(4-methoxyphenyl)-1,3,5-triazine, is also called Bemotrininol, and has a CAS number of 187393-00-6. For example, bis-ethylhexyloxyphenol methoxyphenyl triazine is commercially available as Tinosorb S[®] from BASF. Although bis-ethylhexyloxyphenol methoxyphenyl triazine is known as an organic sunscreen agent protecting UVA and UVB at the same time, it has poor

solubility to a solvent, and thus is disadvantageous in that it should be used after being dissolved in oil, such as alkyl benzoate, having high polarity, and applied only to an oil phase. Such oil generally shows a heavy feeling of use and is greasy. In addition, bis-ethylhexyloxyphenol methoxyphenyl triazine has very low solubility to silicone-based oil. Thus, when bis-ethylhexyloxyphenol methoxyphenyl triazine is applied to a formulation having silicone as an outer phase, it can be incorporated merely in a small amount due to the problem of precipitation. Therefore, there is a problem in that it is not possible to obtain a sufficient sun-screening effect.

Under these circumstances, the inventors of the present disclosure have conducted intensive studies to prepare bis-ethylhexyloxyphenol methoxyphenyl triazine in the form of bowl-like microparticles so that it may be dispersed stably in a formulation without polar oil. As a result, we have found that such microparticles show excellent sebum-absorbing ability and absorb sebum secreted from the skin, when they are applied to the skin, and thus can effectively control sebum remaining on the skin surface. The present disclosure is based on this finding.

As used herein, the term “bowl-like” covers any concave bowl or container shape regardless of the internally dented degree or external bowl shape. For example, the bowl-like shape may be a round concave bowl shape, more particularly a semi-spherical concave bowl shape. The bowl-like shape of microparticles may provide higher sebum absorption as the ratio of internal concave volume is increased. For example, the microparticles may have a sebum absorption of 0.5-1 mL/g. The microparticles may have a

sebum intrusion volume of 1.0-1.5 mL/g. As used herein, the term “non-porous” refers to particles having no pores or voids therein and such particles may have a surface porosity of 0 or approximately 0. According to the present disclosure, use of the bowl-like non-porous microparticles may provide improved sebum absorption as compared to spherical non-porous microparticles by virtue of the internal concave space. Therefore, when applying the bowl-like non-porous microparticles to the skin, they can absorb or adsorb sebum present on the skin to provide a matte and fresh feeling of use. Thus, the cosmetic composition applied to the skin can be retained for a long time by controlling sebum and adsorption of fine dust in the air can be prevented. According to an embodiment of the present disclosure, the bowl-like microparticles are non-porous, and thus have higher particle durability as compared to the conventional porous microparticles, and can disperse hardly soluble bis-ethylhexyloxyphenol methoxyphenyl triazine stably in a formulation. More particularly, the bowl-like non-porous microparticles according to an embodiment of the present disclosure have higher sebum absorption as compared to spherical microparticles and lower sebum absorption as compared to porous microparticles. Therefore, the bowl-like non-porous microparticles can absorb an adequate amount of sebum on the skin, while preventing skin drying, and can provide a matte feeling of use.

According to an embodiment of the present disclosure, the microparticles may have an average diameter of 1-10 μm but are not limited thereto, as long as they can be dispersed stably in the composition formulation while comprising a high content of bis-ethylhexyloxyphenol methoxyphenyl

triazine therein. The average diameter of microparticles is the average value of particles comprised in the composition and is determined through hydrodynamic volume, provided that particles are spherical. Particularly, 30 mL of isotone (Beckman Coulter) is introduced to a 100 mL container, and a small amount of microparticles and dispersant solution (10% of Triton X-100) are added to the container. Then, the resultant solution is dispersed with a 150 W sonicator and particle size analysis is carried out by using Multisizer 4 (Beckman Coulter). The analysis results are shown as median values (d_{50} 3.5-5.5 μm) in the nearest tenth unit. More particularly, the microparticles may have an average diameter of 1 μm or more, 2 μm or more, 3 μm or more, 4 μm or more, 5 μm or more, 6 μm or more, 7 μm or more, 8 μm or more, 9 μm or more, or 9.9 μm or more, and 10 μm or less, 9 μm or less, 8 μm or less, 7 μm or less, 6 μm or less, 5 μm or less, 4 μm or less, 3 μm or less, 2 μm or less, or 1.1 μm or less. Specifically, the microparticles may have an average diameter of 1-8 μm , more specifically 2-6 μm .

According to an embodiment of the present disclosure, bis-ethylhexyloxyphenol methoxyphenyl triazine is not crosslinked into the polymeric crosslinked structure of the polymer matrix, but is dispersed homogeneously in a form near molecular units in the network structure formed by the crosslinked structure. Particularly, the polymeric crosslinked structure may comprise bis-ethylhexyloxyphenol methoxyphenyl triazine, and polymerizate of polymerizable monomers with a multi-functional crosslinking agent. More particularly, the microparticles may be prepared by dispersion polymerization using an oil phase comprising all of bis-ethylhexyloxyphenol

methoxyphenyl triazine, polymerizable monomers and a multi-functional crosslinking agent.

According to an embodiment of the present disclosure, the microparticles may be obtained in different shapes depending on the ratio of bis-ethylhexyloxyphenol methoxyphenyl triazine contained therein. In this context, the bowl-like microparticles according to an embodiment of the present disclosure may comprise bis-ethylhexyloxyphenol methoxyphenyl triazine in an amount of 20-30 wt% based on the total weight of the microparticles. More particularly, the bowl-like microparticles may comprise bis-ethylhexyloxyphenol methoxyphenyl triazine in an amount of 20 wt% or more, 21 wt% or more, 22 wt% or more, 23 wt% or more, 24 wt% or more, 25 wt% or more, 26 wt% or more, 27 wt% or more, 28 wt% or more, 29 wt% or more, or 29.9 wt% or more, and 30 wt% or less, 29 wt% or less, 28 wt% or less, 27 wt% or less, 26 wt% or less, 25 wt% or less, 24 wt% or less, 23 wt% or less, 22 wt% or less, 21 wt% or less, or 20.1 wt% or less, based on the total weight of the microparticles.

According to an embodiment of the present disclosure, the polymerizable monomer may be any radical polymerizable monomer with no particular limitation, as long as it is copolymerizable with the multifunctional crosslinking monomer. Particularly, the polymerizable monomer may be a radical polymerizable monomer containing one ethylene group. For example, the polymerizable monomer may comprise at least one radical polymerizable monomer selected from the group consisting of: at least one aromatic vinyl monomer selected from the group consisting of styrene, methylstyrene, ethylstyrene, fluorostyrene, chlorostyrene and vinyltoluene; and at least one

acrylic vinyl monomer selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, octyl (meth)acrylate, stearyl (meth)acrylate, benzyl (meth)acrylate and glycidyl (meth)acrylate. According to an embodiment of the present disclosure, the multifunctional crosslinking agent may be any monomer capable of crosslinking of the polymerizable monomer with no particular limitation. Particularly, the crosslinking agent may be a crosslinking agent containing two or more ethylene groups. For example, the crosslinking agent may comprise at least one crosslinking agent selected from the group consisting of divinylbenzene, ethylene glycol dimethacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, trimethylene propane trimethacrylate, 1,3-butanediol dimethacrylate, 1,6-hexanediol dimethacrylate and tri(meth)acrylate.

According to an embodiment of the present disclosure, the polymerizate may be methyl methacrylate crosspolymer formed by radical polymerization between methyl methacrylate and ethylene glycol dimethacrylate, and may have a random network structure.

The weight ratio of the polymerizable monomer to the multifunctional crosslinking agent may be varied depending on a desired crosslinking degree with no particular limitation. For example, the multifunctional crosslinking agent may be blended in an amount of 0.1-100 wt%, particularly 1-50 wt%, and more particularly 1-25 wt%, based on 100 wt% of the polymerizable monomer.

According to an embodiment of the present disclosure, the composition may comprise the microparticles in any amount depending on purpose of use with no particular limitation. With a view to controlling sebum effectively, the

composition may comprise the microparticles in an amount of 1-50 wt%, particularly 1 wt% or more, 2 wt% or more, 3 wt% or more, 4 wt% or more, 5 wt% or more, 6 wt% or more, 7 wt% or more, 8 wt% or more, 9 wt% or more, 10 wt% or more, 11 wt% or more, 12 wt% or more, 13 wt% or more, 14 wt% or more, 15 wt% or more, 16 wt% or more, 17 wt% or more, 18 wt% or more, 19 wt% or more, 20 wt% or more, 21 wt% or more, 22 wt% or more, 23 wt% or more, 24 wt% or more, 25 wt% or more, 26 wt% or more, 27 wt% or more, 28 wt% or more, 29 wt% or more, 30 wt% or more, 31 wt% or more, 32 wt% or more, 33 wt% or more, 34 wt% or more, 35 wt% or more, 36 wt% or more, 37 wt% or more, 38 wt% or more, 39 wt% or more, 40 wt% or more, 41 wt% or more, 42 wt% or more, 43 wt% or more, 44 wt% or more, 45 wt% or more, 46 wt% or more, 47 wt% or more, 48 wt% or more, 49 wt% or more, or 49.9 wt% or more, and 50 wt% or less, 49 wt% or less, 48 wt% or less, 47 wt% or less, 46 wt% or less, 45 wt% or less, 44 wt% or less, 43 wt% or less, 42 wt% or less, 41 wt% or less, 40 wt% or less, 39 wt% or less, 38 wt% or less, 37 wt% or less, 36 wt% or less, 35 wt% or less, 34 wt% or less, 33 wt% or less, 32 wt% or less, 31 wt% or less, 30 wt% or less, 29 wt% or less, 28 wt% or less, 27 wt% or less, 26 wt% or less, 25 wt% or less, 24 wt% or less, 23 wt% or less, 22 wt% or less, 21 wt% or less, 20 wt% or less, 19 wt% or less, 18 wt% or less, 18 wt% or less, 17 wt% or less, 16 wt% or less, 15 wt% or less, 14 wt% or less, 13 wt% or less, 12 wt% or less, 11 wt% or less, 10 wt% or less, 9 wt% or less, 8 wt% or less, 7 wt% or less, 6 wt% or less, 5 wt% or less, 4 wt% or less, 3 wt% or less, or 2 wt% or less, based on the total weight of the composition.

According to an embodiment of the present disclosure, the composition

may be a water-in-oil (W/O) type composition. More particularly, the composition may be a water-in-silicone oil (W/S) type composition. As used herein, the term "W/S type" means an emulsion comprising oil essentially comprising silicone oil, as a continuous phase, and a water-containing dispersed phase therein. In other words, the W/S type cosmetic composition means an emulsion comprising a water-containing internal aqueous phase dispersed in a silicone oil-containing external oil phase. According to the present disclosure, bis-ethylhexyloxyphenol methoxyphenyl triazine may be applied to the external phase of the W/O type or W/S type composition at a higher content as compared to the related art by using the stabilized microparticles of bis-ethylhexyloxyphenol methoxyphenyl triazine.

The W/S type cosmetic composition according to an embodiment of the present disclosure may comprise polar oil having at least one polar functional group selected from carboxyl group (COO), ketone group (CO) and hydroxyl group (OH), in an amount of 0-1 wt% based on the total weight of the composition. For example, the polar oil may comprise cetyl ethyl hexanoate, octyl dodecyl myristate, di-C12-13 alkyl maleate, pentaerythrityl tetraisostearate, pentaerythrityl tetraethyl hexanoate, diisostearyl maleate, isopropyl palmitate, C12-C15 alkyl benzoate, dicaprylic carbonate, dicaprylic ether and 2-octyldodecanol.

The W/S type composition according to an embodiment of the present disclosure may comprise at least one silicone-based oil selected from dimethicone, cyclomethicone, phenyl trimethicone, polydimethyl siloxane, methyl phenyl polysiloxane, methyl cyclopolysiloxane, octamethyl cyclotetrasiloxane,

decamethyl cyclopentasiloxane, dodecamethyl cyclohexasiloxane, tetradecamethyl hexasiloxane and octamethyl trisiloxane. According to an embodiment of the present disclosure, the composition may comprise the silicone-based oil in an amount of 15-60 wt%, particularly 15-50 wt%, and more particularly 20-40 wt%, based on the total weight of the composition, but is not limited thereto. According to an embodiment of the present disclosure, the composition may comprise water in the balance amount. In the W/S type cosmetic composition according to an embodiment of the present disclosure, the composition may further comprise a silicone-based surfactant comprising at least one of polyethylene glycol (PEG), polypropylene glycol (PPG) and polyglyceryl group. Particularly, the composition according to an embodiment of the present disclosure may use PEG-added silicone-based surfactant with a view to stable dispersion of microparticles comprising bis-ethylhexyloxyphenol methoxyphenyl triazine and prevention of deposition of bis-ethylhexyloxyphenol methoxyphenyl triazine in the form of crystals at the interface. Particular examples of the PEG-added silicone-based surfactant may comprise PEG/PPG-18/18 dimethicone (cyclopentasiloxane and PEG/PPG-18/18 dimethicone), PEG-30 dipolyhydroxystearate, PEG-7 dimethicone, PEG-10 dimethicone, cyclopentasiloxane/PEG.PPG-19.19 dimethicone, sorbitan isostearate, lauryl PEG.PPG-18.18 methicone, cetyl PEG.PPG-10.1 dimethicone, lauryl PEG-9 polydimethylsiloxylethyl dimethicone, or the like. In addition, the composition according to an embodiment of the present disclosure may use at least one of the above-mentioned PEG-added silicone-based surfactant, but is not limited thereto. More particularly, the PEG-added

silicone-based surfactant may be a nonionic surfactant having a hydrophile-lipophile balance (HLB) of 1-6. For example, the surfactant may be comprised in an amount of 0.01-10 wt%, particularly 1-8 wt%, and more particularly 3-6 wt%, based on the total weight of the composition. When the surfactant is comprised in an amount less than 0.01 wt%, dispersibility of the microparticles may be degraded. When the surfactant is comprised in an amount larger than 10 wt%, stickiness may be caused to reduce a fresh feeling of use.

The cosmetic composition according to an embodiment of the present disclosure may be formulated with a cosmetically or dermatologically acceptable medium or base. This covers any formulation suitable for local application and may be provided in the form of a solution, gel, solid, unhydrous kneaded product, emulsion obtained by dispersing an oil phase in an aqueous phase, suspension, microemulsion, microcapsules, microgranules or ionic (liposome) and non-ionic sachet dispersant, or provided as cream, skin, lotion, powder, ointment, spray or conceal stick. In addition, the cosmetic composition may be used in the form of foam or an aerosol composition further comprising a compressed propellant. Such formulations may be obtained by the method generally known to those skilled in the art.

According to an embodiment of the present disclosure, the composition may be a sunscreen. The sun protection factor (SPF) of the composition may be 10-50 or more, as calculated according to the following formula 1. The protection grade of UVA (PA) may be PA+ to PA++++.

[Formula 1]

Sun protection factor = (Minimal crythema dosis at the skin site to which

cosmetic composition is applied) / (Minimal crythema dosis at the skin site to which no cosmetic composition is applied)

According to an embodiment of the present disclosure, the composition may further comprise an organic sunscreen agent or inorganic sunscreen agent depending on purposes. Each of the organic sunscreen agent or inorganic sunscreen agent may be comprised in an amount of 0.01-20 wt% based on the total weight of the composition, but is not limited thereto. Particularly, the organic sunscreen agent may comprise octylmethoxy cinnamate, octyl salicylate, octocrylene, butylmethoxy dibenzoylmethane, oxybenzone, octyltriazone, methylantranylate, 3,4-methylbenzylidene camphor, isoamyl-P-methoxycinnamate, bisethylhexyloxyphenol methoxyphenyltriazine, methylene bisbenzotriazole tetramethylbutylphenol, or the like. In addition, the inorganic sunscreen agent may comprise powder of titanium dioxide, zinc oxide, iron oxide, or the like.

According to an embodiment of the present disclosure, the composition may be a make-up cosmetic product. Particularly, the composition may be formulated into make-up base, liquid foundation, BB cream, CC cream, concealer, make-up primer, or the like, but is not limited thereto. When the composition is applied to the skin, it shows excellent adhesion to the skin by virtue of the bowl-like shape of the microparticles. In addition, since the composition has a matte and fresh feeling of use by virtue of such excellent adhesion and sebum-controlling ability, it can reduce adhesion of fine dust to the skin significantly as compared to the conventional cosmetic composition. In this context, the composition according to an embodiment of the present

disclosure may be used for preventing adhesion of fine dust.

According to an embodiment of the present disclosure, the cosmetic composition may comprise the active ingredient in combination with the other ingredients with the proviso that the other ingredients do not adversely affect the main effect or can provide a synergic effect with the main effect. The ingredients other than the active ingredient according to the present disclosure may be selected and combined with ease by those skilled in the art depending on the formulation or purpose of use of the cosmetic composition. In addition to the above-mentioned ingredients, the cosmetic composition according to an embodiment of the present disclosure may further comprise other ingredients used currently in a cosmetic composition, if necessary. For example, such ingredients comprise a moisturizing agent, emollient, thickener, organic and inorganic pigments, organic powder, preservative, sterilizing agent, antioxidant, plant extract, pH modifier, alcohol, colorant, fragrance, blood flow-stimulating agent, coolant, anti-perspirant, purified water, or the like. Such ingredients that may be incorporated to the cosmetic composition according to the present disclosure are not limited to the above-described ingredients. In addition, the ingredients may be used without detracting from the objects and effects of the present disclosure.

【Modes for Invention】

Hereinafter, the present disclosure will be explained in more detail with reference to Examples, Comparative Examples and Test Examples. The following examples and experiments are for illustrative purposes only. In

addition, it will be apparent to those skilled in the art that the scope of the present disclosure is not limited to the following Examples, Comparative Examples and Test Examples.

[Example 1]

To a reaction container, 9 g of polyvinyl alcohol was introduced and dissolved in 2000 g of distilled water to prepare an aqueous phase. Next, 200 g of methyl methacrylate (MMA) and 25 g of ethylene glycol dimethacrylate were introduced to an emulsifier and agitated therein for 5 minutes, and then 75 g of bis-ethylhexyloxyphenol methoxyphenyl triazine (BEMT) was further introduced there to and dissolved for 30 minutes to prepare an oil phase. Then, 3 g of 2,2'-azobis-(2,4-dimethylvaleronitrile) as an initiator was introduced and mixed therewith. After that, the aqueous phase was introduced to the emulsifier and dispersion polymerization was carried out for 30 minutes by using the emulsifier, and then the mixture was warmed to carry out reaction at 50°C and reacted for 15 hours. The resultant multi-dispersed microparticles were dehydrated by using a depressurized filter and washed with water three times, followed by vacuum drying. In this manner, bowl-like microparticles comprising 25 wt% of bis-ethylhexyloxyphenol methoxyphenyl triazine was obtained (yield = 90%, average diameter of microparticles = 2 μ m).

FIG. 1A to FIG. 1F show the scanning electron microscopic (SEM) images (FIG. 1A and FIG. 1B) of the resultant bowl-like microparticles together with SEM images of Comparative Examples, i.e. porous PMMA spherical particles (Comparative Example 1, FIG. 1C and FIG. 1D) and non-porous

PMMA spherical particles (Comparative Example 2, FIG. 1E and FIG. 1F). Each of the right-side images (FIG. 1B, FIG. 1D, FIG. 1F) is an image taken at a higher magnification as compared to the corresponding left-side image (FIG. 1A, FIG. 1C, FIG. 1E) and illustrates the same sample. As can be seen from FIG. 1A and FIG. 1B, the microparticles according to an embodiment of the present disclosure has a characteristic round bowl-like structure. It is thought that such a shape results from a high crosslinking degree of the polymer matrix forming the particles configured to incorporate a high content of bis-ethylhexyloxyphenol methoxyphenyl triazine stably therein and the concentration of bis-ethylhexyloxyphenol methoxyphenyl triazine incorporated homogeneously in the polymer matrix.

In addition, the resultant bowl-like microparticles were used to determine oil absorption and total intrusion volume. The oil absorption was determined according to JIS K 5101-13-1 as a test method for oil absorption of a substrate in a room controlled at room temperature (23°C), and the total intrusion volume was determined by using a porosimeter (Autopore IV 9500, micrometrics, Londonderry, NH, USA). The result of oil absorption and that of total intrusion volume are correlated with each other. As can be seen from the results of the following Table 1, the microparticles according to an embodiment of the present disclosure have an oil absorption of 0.888 mL/g and a total intrusion volume of 1.37 mL/g. The results correspond to an oil absorption at least 150% higher than the oil absorption of non-porous PMMA spherical particles and to a total intrusion volume at least 210% higher than the total intrusion volume of non-porous PMMA spherical particles. In addition, the results correspond to an oil

absorption of about 56% of the oil absorption of porous PMMA spherical particles and to a total intrusion volume of about 0.87 times of the total intrusion volume of porous PMMA spherical particles. This is derived from the bowl-like shape of the microparticles according to an embodiment of the present disclosure and non-porous characteristics thereof.

[Table 1]

	Oil absorption (mL/g)	Total intrusion volume (mL/g)
Example 1 (bowl-like non-porous microparticles)	0.888	1.37
Comparative Example 1 (porous spherical PMMA microparticles)	1.60	1.57
Comparative Example 2 (non-porous spherical PMMA microparticles)	0.573	0.65

[Test Example 1]

To analyze the composition comprising bowl-like microparticles according to an embodiment of the present disclosure in terms of a feeling of use, the following test was carried out in comparison with Comparative Examples using different types of powder corresponding to the microparticles.

First, the oil phase ingredients were mixed by using the composition as shown in Table 2, followed by homogeneous dispersion and dissolution. The aqueous phase ingredients were dissolved under warming to 40-50°C and introduced to the oil phase ingredients to obtain each of the W/S type cosmetic compositions by using a homogenizer.

[Table 2]

	Ingredients	Ex. 2	Comp. Ex. 3 (Vehicle)	Comp. Ex. 4 (CR50)	Com p. Ex. 5 (Art- pearl)
Oil phase	Ethylhexylmethoxy cinnamate	5	5	5	5
	Ethylhexyl salicylate	3	3	3	3
	Dimethicone	20	20	20	20
	Cyclopentasiloxane*Cyclohexasil oxane	10	10	10	10
	C12-15 alkyl benzoate*C12-15 alcohols	6	6	6	6
	Disteardimonium hectorite	0.3	0.3	0.3	0.3
	PEG-10 dimethicone	1.5	1.5	1.5	1.5
	Tocopherol*Lauryl PEG-9 Polydimethylsiloxylethyl dimethicone	1.5	1.5	1.5	1.5
	Example 1	8	-	-	-
	Comparative Example 2	-	-	-	8
	Titanium dioxide (CI 77891)*Aluminum hydroxide *Triethoxycaprylylsilane	-	-	8	-
Aqueo us phase	Distilled water	To 100	To 100	To 100	To 100
	Polyol	5	5	5	5
	Sodium chloride	1	1	1	1
	2Na EDTA	0.05	0.05	0.05	0.05
	Preservative	1.15	1.15	1.15	1.15
Total (wt%)		100	100	100	100

Example 2 is a formulation comprising the microparticle powder according to Example 1, Comparative Example 3 is a vehicle formulation

comprising no powder, Comparative Example 4 is a formulation comprising a raw material of TiO₂ colorant available as OTS-2 TiO₂ CR-50, and Comparative Example 5 is a formulation comprising Comparative Example 2 (non-porous spherical PMMA microparticles).

Then, 10 training panels (AP R&D skin care training panels) in Amore Pacific Research Laboratory were allowed to use each of the formulations according to Example 2 and Comparative Examples 2-4 and to evaluate a feeling of use according to the following scheme.

- Evaluate quality upon application and after absorption, while allowing a test product to be absorbed to the skin through rolling for 2 minutes.
- Repeat evaluation twice for the same test product.

1) The same lotion is applied to the forearm in a predetermined amount and then allowed to stand for 3 minutes for absorption.

2) After absorption, the same foam cleanser is used to clean the forearm.

3) The application site is marked at the cleansing-finished forearm by using a circular stamp having a diameter of 5 cm.

4) A test product is provided in the marked circle in an amount of 50 μ L.

5) Rolling is carried out twice for 10 seconds by using the index finger (twice/sec).

6) Right after rolling, absorption rate (degree) is determined, while tapping the skin with the index finger and middle finger.

7) After the completion of absorption, the test site is allowed to stand

until the 2 minute-alarm rings.

8) After 2 minutes, post-absorption quality is evaluated.

The test items comprise to 10 items corresponding to feelings of use upon the application of each composition (coolness, applicability, slipperiness, greasy feeling, oily feeling, watery feeling, thickness, adhesion, stickiness and absorption rate) and 7 items corresponding to feelings of use after absorption (gloss, oily feeling after absorption, moisty feeling, stickiness after absorption, softness, silkiness and feeling of residue).

As a result, as shown in FIG. 2, test products generally show a similar tendency of applicability, although there is a little difference depending on powder type. In the case of Comparative Example 4 (CR50), it shows thick applicability due to its unique stiff applicability and thick feeling of use, and particularly tends to be hardly absorbed, since the formulation is not absorbed but remains on the skin.

As shown in FIG. 3, Example 2 and Comparative Example 5 (Art-pearl) show a similar tendency after absorption, although there is a difference in finished feeling depending on powder type. In the case of Comparative Example 3 (Vehicle), it shows a strong oily feeling after absorption and is evaluated to provide a feeling of use leaving high gloss and residue. In the case of Example 2, it shows a similar tendency of finished feeling as compared to Comparative Example 5 (Art-pearl) and provides lower gloss and oily feeling after absorption. In the case of Comparative Example 5 (Art-pearl), it is evaluated to provide a softer and silkier feeling as compared to Example 2 by virtue of its feeling derived from powder particles, but shows a higher oily feeling

and gloss as compared to Example 2 after absorption.

FIG. 4 and FIG. 5 show the detailed evaluation results of Example 2 and Comparative Example 3 (Vehicle) in terms of a feeling of use. As shown in FIG. 5, Example 2 shows a softer feeling of use after absorption as compared to Comparative Example 3 (Vehicle) and provides a significantly reduced oily feeling, feeling of residue and stickiness after absorption. It is thought that the bowl-like microparticles according to Example 2 absorb skin sebum to provide a fresher feeling of use.

[Test Example 2]

The following clinical test was carried out to evaluate the fine dust-protecting ability of the composition comprising the bowl-like microparticles according to an embodiment of the present disclosure (Example 2, Product name: 3088008).

The following description is the test result extracted from the research report (PNK-18N15-BR1R2), "Human body application test for skin tone, recognized whitening index (VB), homogeneity, skin texture covering ability, water loss and substitute fine dust-protecting ability of 3088008 (CSR-B1W-43396)", which was requested to a skin clinic research center by Amore Pacific Co. and received on December 26, 2018.

Test Product

Product name: 3088008, Material reference number: 18N15-BR1-S2

Use of Test Product

After defining a test product-application site and artificial sebum-application site (width x length = 1.5 x 4 cm) at the forearm of a test subject, a test product and artificial sebum were applied to the defined site each in an amount of 1 $\mu\text{L}/\text{cm}^2$.

Time of Using Test Product

Once

Selection of Test Subject

25 to 35-year-old females meeting the selection criteria and not corresponding to the exclusion criteria.

-Selection Criteria

1. Persons who receive a sufficient explanation about the items to be notified by the test manager or person receiving trust from the test manager, and write and sign in a consent form.

2. Healthy persons free from acute and chronic body diseases comprising skin diseases.

3. Persons who allow shadow tracking during the test period.

- Exclusion Criteria

1. Persons suffering from psychiatric diseases.

2. Persons suffering from infective skin diseases.

3. Persons who receive immunosuppressive drug therapy within 3 months before starting the test.

4. Persons who receive systemic steroid or photo therapy within one month before starting the test.
5. Persons who have a lesion at the test site and make it difficult to test.
6. Persons having atopic skin.
7. Persons who are significantly sensitive to cosmetics, medicines or daily light exposure or have allergy.
8. Persons who receive skin scaling or skin care within 3 months before starting the test.
9. Pregnant or breast-feeding women.
10. Other persons judged as unsuitable for the human body application test by the test manager or the person in charge of the test.

Test Method

To carry out instrumental evaluation, the test subjects were allowed to take a rest in a room under a constant-temperature/constant-humidity condition at a temperature of 20-25°C with a humidity of 40-60% for 30 minutes so that their skin surface temperature and humidity might accommodate to the environment of the test space. While taking a rest, the test subjects were limited to water intake. To carry out objective determination, one researcher carried out the test and the same site was tested each time of test.

Before using the test product, right after using the test product and after applying substitute fine dust, substitute fine dust-protecting ability was determined.

To determine the substitute fine dust-protecting effect, a test product-

application site and artificial sebum-application site (width x length 1.5 x 4 cm) were defined at the forearm of a test subject, and then a test product and artificial sebum were applied thereto. Then, the forearm site of the subject was transferred to the sealed space in a spraying machine, and an adequate amount (about 1.5 g) of substitute fine dust (carbon powder) comprising carbon as a main ingredient of substitute fine dust was sprayed in all directions to cause adsorption. Before using the test product, right after using the test product, and after spraying the substitute fine dust, the forearm site was photographed by using Visia-CR. The photographed images were analyzed by Image-pro[®] plus, and a specific region is designated in the images to carry out evaluation by a difference in brightness (intensity) in the region. The brightness (intensity) is decreased as the region approaches a black color. Each brightness (intensity) value is corrected by subtracting it from the maximum value 255 of a color field (0-255).

Results of Determination of Substitute Fine Dust-Protecting Ability

A change in substitute fine dust-protecting ability of a test product was determined after using the test product.

- Test product: there is a significant increase by 29.377% ($p < 0.05$) after spraying substitute fine dust, as compared to right after using the test product.
- Artificial sebum: there is a significant increase by 32.436% ($p < 0.05$) after spraying substitute fine dust, as compared to right after using the test product.

- Inter-group comparison: the test product shows a significant difference ($p < 0.05$) after spraying substitute fine dust based on the result right after using the test product, as compared to artificial sebum (see, FIG. 6 to FIG. 8).

Conclusion

Therefore, it is judged that “3088008” product is a product which helps improvement of substitute fine dust-protecting ability with once use.

According to the present disclosure, the following embodiments may be provided.

According to the first embodiment, there is provided a composition for improving a sebum-controlling ability of a sunscreen which comprises bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed.

According to the second embodiment, there is provided the composition as defined in the first embodiment, wherein the bis-ethylhexyloxyphenol methoxyphenyl triazine is comprised in an amount of 20-30 wt% based on the total weight of microparticles.

According to the third embodiment, there is provided the composition as defined in the first or the second embodiment, wherein an average diameter of the microparticles is 1-10 μm .

According to the fourth embodiment, there is provided the composition as defined in any one of the first to the third embodiments, wherein a sebum

absorption of the microparticles is 0.5-1 mL/g.

According to the fifth embodiment, there is provided the composition as defined in any one of the first to the fourth embodiments, wherein a sebum intrusion volume of the microparticles is 1.0-1.5 mL/g.

According to the sixth embodiment, there is provided the composition as defined in any one of the first to the fifth embodiments, wherein the polymer matrix comprises bis-ethylhexyloxyphenol methoxyphenyl triazine, and polymerizate of polymerizable monomers with a multi-functional crosslinking agent.

According to the seventh embodiment, there is provided the composition as defined in any one of the first to the sixth embodiments, wherein the polymerizable monomer comprises at least one selected from the group consisting of: at least one aromatic vinyl monomer selected from the group consisting of styrene, methylstyrene, ethylstyrene, fluorostyrene, chlorostyrene and vinyltoluene; and at least one acrylic vinyl monomer selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, octyl (meth)acrylate, stearyl (meth)acrylate, benzyl (meth)acrylate and glycidyl (meth)acrylate.

According to the eighth embodiment, there is provided the composition as defined in any one of the first to the seventh embodiments, wherein the multifunctional crosslinking agent comprises at least one selected from the group consisting of divinylbenzene, ethylene glycol dimethacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, trimethylene propane trimethacrylate, 1,3-butanediol dimethacrylate, 1,6-hexanediol dimethacrylate

and tri(meth)acrylate.

According to the ninth embodiment, there is provided the composition as defined in any one of the first to the eighth embodiments, wherein the composition comprises the microparticles in an amount of 1-50 wt% based on the total weight of the composition.

According to the tenth embodiment, there is provided the composition as defined in any one of the first to the ninth embodiments, wherein the composition is a water-in-oil (W/O) type composition.

According to the eleventh embodiment, there is provided the composition as defined in any one of the first to the tenth embodiments, wherein the composition is a make-up cosmetic product.

According to the twelfth embodiment, there is provided the composition as defined in any one of the first to the eleventh embodiments, wherein the composition is for use in prevention of fine dust adsorption.

【CLAIMS】

【Claim 1】

A composition for improving a sebum-controlling ability of a sunscreen which comprises bowl-like non-porous microparticles comprising a polymer matrix in which bis-ethylhexyloxyphenol methoxyphenyl triazine is dispersed as an active ingredient.

【Claim 2】

The composition according to claim 1, wherein the bis-ethylhexyloxyphenol methoxyphenyl triazine is comprised in an amount of 20-30 wt% based on the total weight of microparticles.

【Claim 3】

The composition according to claim 1, wherein an average diameter of the microparticles is 1-10 μm .

【Claim 4】

The composition according to claim 1, wherein a sebum absorption of the microparticles is 0.5-1 mL/g.

【Claim 5】

The composition according to claim 1, wherein a sebum intrusion volume of the microparticles is 1.0-1.5 mL/g.

【Claim 6】

The composition according to claim 1, wherein the polymer matrix comprises bis-ethylhexyloxyphenol methoxylphenyl triazine, and polymerizate of polymerizable monomers with a multi-functional crosslinking agent.

【Claim 7】

The composition according to claim 6, wherein the polymerizable monomer comprises at least one selected from the group consisting of: at least one aromatic vinyl monomer selected from the group consisting of styrene, methylstyrene, ethylstyrene, fluorostyrene, chlorostyrene and vinyltoluene; and at least one acrylic vinyl monomer selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, octyl (meth)acrylate, stearyl (meth)acrylate, benzyl (meth)acrylate and glycidyl (meth)acrylate.

【Claim 8】

The composition according to claim 6, wherein the multifunctional crosslinking agent comprises at least one selected from the group consisting of divinylbenzene, ethylene glycol dimethacrylate, diethylene glycol dimethacrylate, triethylene glycol dimethacrylate, trimethylene propane trimethacrylate, 1,3-butanediol dimethacrylate, 1,6-hexanediol dimethacrylate and tri(meth)acrylate.

【Claim 9】

The composition according to claim 1, wherein the composition comprises the microparticles in an amount of 1-50 wt% based on the total weight of the composition.

【Claim 10】

The composition according to claim 1, wherein the composition is a water-in-oil (W/O) type composition.

【Claim 11】

The composition according to claim 1, wherein the composition is a make-up cosmetic product.

【Claim 12】

The composition according to claim 1, wherein the composition is for use in prevention of fine dust adsorption.