[Description]

[Title of Invention]

COMPOSITION FOR FINE DUST PREVENTION CONTAINING NEGATIVELY CHARGED MATERIAL

[Technical Field]

The present specification discloses a composition for dust prevention containing an anionic emulsion stabilizer or a thickener.

[Background Art]

Dust accumulation in the human body causes the body immunity to drop and may trigger various diseases such as heart disease or respiratory diseases. It even causes bronchial stenosis. Prolonged inhalation of dust increases the prevalence rate of asthma and lung diseases and increase early mortality.

The skin, which is located at the outermost part of our body and comes into direct contact with dust, serves as a barrier between the organism and the environment. When the skin is often exposed to pollution directly, this barrier function is impaired. In particular, fine dust is 20 times smaller than the pores and thus can easily penetrate the skin. In fact, air pollutants such as fine dust are known to have a profound effect on skin health. In the short term, they increase premature aging, moisture loss, and wrinkles such as fine wrinkles. In the long term, they may irreparably damage the skin to cause the skin to lose its ability to protect the body from environmental factors, thus resulting in serious illnesses such as skin cancer.

Therefore, there is a need for studies on cosmetics for isolating dust, which is a toxic material harmful to the skin and which sometimes causes a fatal disorder in the human body, from the skin.

[Summary of Invention]

[Technical Problem]

In an aspect, the present invention is to prevent the attachment of dust on the skin.

In another aspect, the present invention is to make the fine dust penetrated into a cosmetic composition float in the cosmetic composition.

In another aspect, the present invention is to minimize the penetration of the fine dust penetrated into a cosmetic composition into the skin.

In another aspect, the present invention is to prevent or minimize skin contamination due to fine dust.

[Solution to Problem]

In an aspect, the present invention provides a composition for dust prevention containing, as an active ingredient, a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, wherein the negatively charged material is at least one of an emulsion stabilizer and a thickener.

[Advantageous Effects of Invention]

In an aspect, the composition for dust prevention of the present invention can minimize the penetration of dust, especially, fine dust, into the skin. Specifically, a negatively charged material contained as an active ingredient in the composition for dust prevention has a similar negative charge zeta potential to dust, and thus can minimize the attachment of dust on the skin surface by electrostatic force. In addition, even though dust penetrates into the cosmetic composition coated on the skin, the dust floats in the emulsion stabilizer or thickener, and thus, the cosmetic composition can prevent the penetration of dust into the skin. Especially, the cosmetic composition can prevent the penetration of fine dust into the skin to minimize the skin inflammation and the accumulation of heavy metals due to the penetration of fine dust, and thus is beneficial for skin health.

[Brief Description of Drawings]

FIG. 1 shows a photograph representing the results of a carbon black adsorption test on an artificial leather treated with the composition for dust prevention of the present invention.

FIG. 2 shows photographs representing the results of visual check of the carbon black remaining on the skin after tape stripping of the skin treated with the composition for dust prevention of the present invention.

FIG. 3 shows a graph representing the change in the amount of the carbon black remaining on the skin after tape stripping of the skin treated with the composition for dust prevention of the present invention.

[Description of Embodiments]

[Embodiments]

Hereinafter, the present invention will be described in detail.

As used herein, the term “dust prevention” refers to preventing or minimizing the attachment of dust to the skin or preventing or minimizing the penetration of the dust temporarily attached to the skin into the skin by removing the dust. That is, when the composition for dust prevention of the present invention is coated onto the skin, it can minimize the attachment of dust to the skin, and even if dust is attached to the skin, it can be easily removed by physical force such as wind. Further, even if dust enters into the cosmetic composition coated on the skin, the dust floats in the cosmetic composition, and thus, the cosmetic composition can prevent the penetration of dust into the skin.

As used herein, the term “dust” refers collectively to fine particles mixed in the air, and usually it means a floating material having a particle diameter of 0.1um to 10mm. Particularly, the dust having a particle diameter of 10um or less is called fine dust, and the dust having a particle diameter of 0.1um or less is called ultrafine dust. Here, the particle diameter may refer to an average value of the diameter of each fine dust particle. Dust includes materials derived from nature such as sand, soil, and pollen, and materials derived from industrial processes such as carbon, carbon combustion products, metal salts, and heavy metals. Dust may exist in the form of fumes, mist, smoke, steam or smog. In general, dust, particularly fine dust, has a negative zeta potential.

In one aspect, the present invention relates to a composition for dust prevention containing, as an active ingredient, a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, wherein the negatively charged material is at least one of an emulsion stabilizer and a thickener. As used herein, the term “negatively charged material” may refer to a material having a negative zeta potential. The zeta potential can be measured by a conventionally known method. For example, it can be measured by preparing an aqueous solution containing 0.01 wt% of a sample, loading 100ul of the solution in a quartz cuvette, and then performing measurement using a Zetasizer Nano ZS (Malvern).

The negatively charged material may have a zeta potential of -3mV or less, -4mV or less, -5mV or less, -7mV or less, -9mV or less, -10mV or less, -20mV or less,

-30mV or less, -40mV or less, or -50mV or less, although not limited thereto.

In the above aspect, the negatively charged material may have a zeta potential of -100 mV to -5mV in a pH 7 aqueous solution. In addition, the zeta potential may be -50mV to -10mV. For example, the zeta potential may be -100mV or more, -90mV or more, -80mV or more, -70mV or more, -60mV or more, -50mV or more, -40mV or more, -30mV or more, -20mV or more, -10mV or more, -9mV or more, -7mV or more, -6mV or more, or -5mV or more and -5mV or less, -6mV or less, -8mV or less, -10mV or less, -20mV or less, -30mV or less, -40mV or less, -50mV or less, -60mV or less, -70mV or less, -80mV or less, -90mV or less, -95mV or less, or -99mV or less, although not limited thereto.

Since the negatively charged material has the above zeta potential, the composition prevents the attachment of fine dust by the electrostatic repulsive force against fine dust. In addition, even if dust is attached, it can be easily removed.

In the above aspect, the thickener may have a viscosity of 100cps to 500000cps. For example, the viscosity may be 100cps to 500000cps, 200cps to 500000cps, 300cps to 500000cps, 400cps to 500000cps, 100cps to 400000cps, 100cps to 300000cps, 200cps to 400000cps, 300cps to 300000cps, 300cps to 300000cps, 400cps to 300000cps, or 500cps to 300000cps, although not limited thereto.

In the above aspect, the thickener may have a viscosity of 500cps to 300000cps. For example, the viscosity may be 500cps or more, 1000cps or more, 5000cps or more, 10000cps or more, 50000cps or more, 100000cps or more, 200000cps or more, or 300000cps or more and 300000cps or less, 200000cps or less, 100000cps or less, 50000cps or less, 30000cps or less, 10000cps or less, 5000cps or less, 3000cps or less, 1000cps or less, 900cps or less, 700cps or less, or 600cps or less, although not limited thereto. When the thickener has a viscosity of 500 to 300000cps, the composition has a good spreadability on the skin and makes the dust attached to the composition float in the composition, thereby effectively preventing dust from penetrating into the skin. The viscosity can be measured by a method well known to a person skilled in the art. For example, the viscosity can be measured after 2 minutes rotation at 12 rpm and room temperature using a viscometer (Brookfield DV-II Pro viscometer) and an LV spindle.

In the composition for dust prevention according to one aspect of the present invention, the emulsion stabilizer is an ingredient that helps in the formation of emulsion and the stabilization of the formed emulsion and which prevents or reduces

emulsion coalescence by means of a mechanism such as electrical repulsion, viscosity change, and the formation of a film on the emulsion layer. Specifically, the emulsion stabilizer may be selected from the group consisting of glyceryl stearate citrate, cetostearyl alcohol, stearic acid, glyceryl stearate, potassium cetyl phosphate, sodium stearoyl glutamate, and cetyl alcohol, although not limited thereto.

Also, the term "thickener" refers to an ingredient added to a colloidal solution, a polymer solution, etc. to increase the viscosity of the solutions and thereby to impart thixotropy thereto. Specifically, the thickener may be selected from the group consisting of carbomer, acrylate/C_{10-30} alkyl acrylate crosspolymer, acrylate/C_{12-22} alkyl methacrylate copolymer, acrylate/beheneth-25 methacrylate copolymer, hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer, ammonium acryloyldimethyltaurate/VP copolymer and sodium polyacrylate, although not limited thereto.

In the above aspect, the content of the emulsion stabilizer in the composition may be 0.001 to 20 wt% based on the total weight of the composition. For example, it may be 0.001 wt% or more, 0.01 wt% or more, 0.1 wt% or more, 0.3 wt% or more, 0.5 wt% or more, 0.7 wt% or more, 0.9 wt% or more, 1.0 wt% or more, 3 wt% or more, 5 wt% or more, 7 wt% or more, 9 wt% or more, 10 wt% or more, 13 wt% or more, 15 wt% or more, 17 wt% or more, or 19 wt% or more and 20 wt% or less, 19 wt% or less, 18 wt% or less, 16 wt% or less, 14 wt% or less, 12 wt% or less, 11 wt% or less, 9 wt% or less, 7 wt% or less, 6 wt% or less, 4 wt% or less, 2 wt% or less, 1 wt% or less, 0.1 wt% or less, 0.01 wt% or less, or 0.005 wt% or less, although not limited thereto.

Further, in the above aspect, the content of the thickener in the composition may be 0.01 to 20 wt% based on the total weight of the composition. For example, it may be 0.01 wt% or more, 0.1 wt% or more, 0.3 wt% or more, 0.5 wt% or more, 0.7 wt% or more, 0.9 wt% or more, 1.0 wt% or more, 3 wt% or more, 5 wt% or more, 7 wt% or more, 9 wt% or more, 10 wt% or more, 13 wt% or more, 15 wt% or more, 17 wt% or more, or 19 wt% or more and 20 wt% or less, 19 wt% or less, 18 wt% or less, 16 wt% or less, 14 wt% or less, 12 wt% or less, 11 wt% or less, 9 wt% or less, 7 wt% or less, 6 wt% or less, 4 wt% or less, 2 wt% or less, 1 wt% or less, 0.1 wt% or less, or 0.02 wt% or less, although not limited thereto.

In one embodiment, the weight ratio of the emulsion stabilizer and the thickener in the composition may be 1: 0.1-10. For example, it may be 1: 0.1, 1: 0.5,

1: 1, 1: 3, 1: 5, 1: 7, 1: 9 or 1: 10, although not limited thereto. When both the emulsion stabilizer and the thickener are included, dust is made to float in the thickener, in addition to a repulsive force effect of a negative charge, which leads to more effective dust prevention effects.

In the above aspect, the composition may prevent the fine dust having a particle diameter of 10um or less. The particle diameter may be 100um or less, 90um or less, 70um or less, 50um or less, 30um or less, 20um or less, 15um or less or 10um or less, although not limited thereto.

In the above aspect, the composition for dust prevention may be a cosmetic composition, and the cosmetic composition may be a cosmetic composition for makeup, in particular, a softening lotion, a lotion, a cream or an essence.

As used herein, the term “cosmetics” may refer to any material which can have a medical function in addition to a cosmetic function.

Specifically, the cosmetic composition may be, for example, basic cosmetics, makeup cosmetics, or body cosmetics, etc. The formulation thereof is not particularly limited and may be appropriately selected according to the purpose.

For example, the cosmetic composition may be formulated into a solution, a suspension, an emulsion, a paste, a gel, a cream, a lotion, a powder, a soap, a surfactant-containing cleanser, an oil, a powder foundation, an emulsion foundation, a wax foundation, a spray, etc., although not limited thereto. More specifically, the cosmetic composition may be formulated into basic cosmetics such as a sunscreen, a softening lotion, a nourishing lotion, a lotion, a body lotion, a nourishing cream, a massage cream, a moisturizing cream, a hand cream, an essence, an eye cream, a cleansing cream, a cleansing foam, a cleansing water, a pack, a gel, a patch, an oil-in-water (O/W) emulsion, a water-in-oil (O/W) emulsion, etc. and color makeup cosmetics such as a lipstick, a makeup base, a foundation, etc.

In another aspect, the present invention may relate to a method for dust prevention comprising the step of coating onto the skin a composition containing, as an active ingredient, a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, and which is at least one of an emulsion stabilizer and a thickener.

In another aspect, the present invention may relate to the use of a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, and which is at least one of an emulsion stabilizer and a thickener, for dust prevention.

In another aspect, the present invention may relate to the use of a negatively charged material for the preparation of a composition for dust prevention containing, as an active ingredient, a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, and which is at least one of an emulsion stabilizer and a thickener.

Hereinafter, the present invention will be described in more detail with reference to the following Example and Test Examples. However, the following Example and Test Examples are provided for illustrative purposes only in order to facilitate understanding of the present invention, and the scope of the present invention is not limited thereto.

[Example] Preparation of Composition for Dust Prevention

In order to confirm the dust prevention effect of a composition for dust prevention containing a negatively charged material as an active ingredient, a composition for dust prevention containing a negatively charged material which is at least one of an emulsion stabilizer and a thickener was prepared. Specifically, compositions containing some of the various candidate materials as shown in Table 1 below and ingredients as set forth in Table 2 below were prepared. A composition containing neither an anionic emulsion stabilizer nor a thickener was used as a negative control. The composition of the negative control further containing a cationic emulsion stabilizer was used as a positive control. The composition of the negative control further containing an anionic emulsion stabilizer was used as Example 1. The composition of Example 1 further containing an anionic thickener was used as Example 2.

[Table 1]

Classification	Sample	Zeta potential (mV)
Negatively charged material candidate	Sodium stearoyl glutamate	-42.0
	Potassium cetyl phosphate	-38.4
	Sodium polyacrylate	-5.3
Positively charged material candidate	Polyquaternium-51	5.32
	Distearyldimonium chloride	10.3

Uncharged material candidate	Polysorbate 60	0.2
	Xanthan gum	-0.15

[Table 2]

Ingredients	Positive control	Negative control	Example 1 (composition for dust prevention 1)	Example 2 (composition for dust prevention 2)
Purified water	Balance	Balance	Balance	Balance
Polyisobutene	10	10	10	10
Polysorbate 60	1.2	1.2	1.2	1.2
Glycerin	5	5	5	5
Butylene glycol	5	5	5	5
Preservative, colorant, fragrance	q.s.	q.s.	q.s.	q.s.
Xanthan gum	0.5	0.5	0.5	0.5
Cationic emulsion (distearyldimonium chloride)	0	1.0	0	0
Anionic emulsion stabilizer (potassium cetyl phosphate)	0	0	1.0	1.0
Anionic thickener (sodium polyacrylate)	0	0	0	0.2

[Test Example 1] Zeta Potential Analysis of Fine Dust and Yellow Dust Standard Materials and Selection of a Fine Dust Substitute

In order to select a dust substitute to be used for confirming the dust prevention effect of the compositions for dust prevention prepared in the above Example, zeta potentials of fine dust, yellow dust, and dust substitute candidates were analyzed. The zeta potential was measured by a method generally known in the art, and the results are shown in Table 3 below.

[Table 3]

Classification	Sample	Zeta potential (mV)
Fine dust	Fine dust (Hankuk University of Foreign Studies)	-16.7
	Yellow dust (Yangjae-dong, Seoul)	-21.2
	European standard material (ERM®CZ 120)	-14.3
In vitro test sample	Carbon black (LC902)	-18.3
	Iron oxide (Mapico)	-0.1
	Charcoal powder	-29.0

* Informations listed in parentheses are the sources of each material.

Fine dust is generally composed of 22% of organic carbon compounds, 8% of carbon element, 22% of nitrate, 15% of sulfate, 15% of earth's crust components and 18% of others (National Academy of Sciences). Thus, in the present invention, carbon black, which occupies about 30% (organic carbon compounds and carbon element) of the components of fine dust and has a similar zeta potential to fine dust, was selected as a fine dust substitute.

[Test Example 2] Skin adsorption system-mimicking in vitro model

The dust prevention effect of the compositions for dust prevention prepared in the above Example was confirmed using a skin adsorption system-mimicking model. Specifically, 3x5cm artificial leathers were coated with 5g of each of the negative control, the positive control, Example 1 and Example 2 prepared in the above Example, and then placed in a convection box containing 3.125g (which is 500000 times the fine dust warning level of Korea Meteorological Administration) of carbon black. Then, the air in the convection box was sufficiently convected by using a convection circulator, and then the carbon black remaining on the artificial leather was visually checked. The results are shown in FIG. 1. As shown in FIG. 1, less carbon black was observed in the leathers coated with Example 1 or Example 2, which is a composition for dust prevention of the present invention.

[Test Example 3] Tape-stripping Test on the Stratum Corneum

A tape-stripping test on the stratum corneum was performed to confirm the dust prevention effect of Example 2 prepared in the above Example. Specifically, the skin was cleaned, and 2ul/cm^2 of Example 2 was coated onto a 2x2cm^2 area of the forearm, followed by drying for 5 minutes. Then, 5ul of a composition containing 5 wt% of carbon black was coated thereon, followed by drying for 10 minutes. The image of the skin was evaluated using an optical camera (VISIA-CR). After washing with running water for 5 seconds, the image of the previously evaluated skin was evaluated again with an optical camera. In addition, after performing the operation of attaching and removing a D-Squame® tape from the skin 10 times through a tape stripping test, the amount of the carbon black remaining on the skin was measured with an optical camera. The image was separated and summed up based on the color and intensity using an image analysis program (Image Pro plus), to digitize the image, and the results were plotted in a graph (FIG. 2 and FIG. 3).

Hereinafter, a formulation example of the composition according to the present invention will be described. However, the cosmetic composition may be formulated into various other forms. This example is for illustrative purposes only and is not intended to limit the scope of the present invention.

[Table 4] Oil-in-water emulsion cosmetic

Ingredients	wt%
Purified water	Balance
Polyisobutene	10
Polysorbate 60	1.2
Glycerin	5
Butylene glycol	5
Preservative, colorant, fragrance	q.s.
Thickener	0.5
At least one of potassium cetyl phosphate and sodium polyacrylate	1.0

[Claims]

[Claim 1]

A composition for dust prevention containing, as an active ingredient, a negatively charged material having a zeta potential of -3mV or less in a pH 7 aqueous solution, wherein the negatively charged material is at least one of an emulsion stabilizer and a thickener.

[Claim 2]

The composition for dust prevention according to claim 1,

wherein the negatively charged material has a zeta potential of -100mV to -5mV in a pH 7 aqueous solution.

[Claim 3]

The composition for dust prevention according to claim 1,

wherein the negatively charged material has a zeta potential of -50mV to -10mV in a pH 7 aqueous solution.

[Claim 4]

The composition for dust prevention according to claim 1,

wherein the thickener has a viscosity of 100cps to 500000cps.

[Claim 5]

The composition for dust prevention according to claim 1,

wherein the thickener has a viscosity of 500cps to 300000cps.

[Claim 6]

The composition for dust prevention according to claim 1,

wherein the emulsion stabilizer is selected from the group consisting of glyceryl stearate citrate, cetostearyl alcohol, stearic acid, glyceryl stearate, potassium cetyl phosphate, sodium stearoyl glutamate, and cetyl alcohol.

[Claim 7]

The composition for dust prevention according to claim 1,

wherein the thickener is selected from the group consisting of carbomer, acrylate/C_{10-30} alkyl acrylate crosspolymer, acrylate/C_{12-22} alkyl methacrylate copolymer, acrylate/beheneth-25 methacrylate copolymer, hydroxyethyl acrylate/sodium acryloyldimethyl taurate copolymer, ammonium acryloyldimethyltaurate/VP copolymer and sodium polyacrylate.

[Claim 8]

The composition for dust prevention according to claim 1,

wherein the content of the emulsion stabilizer in the composition is 0.001 to 20 wt% based on the total weight of the composition.

[Claim 9]

The composition for dust prevention according to claim 1,

wherein the content of the thickener in the composition is 0.01 to 20 wt% based on the total weight of the composition.

[Claim 10]

The composition for dust prevention according to claim 1,

wherein the weight ratio of the emulsion stabilizer and the thickener in the composition is 1: 0.1-10.

[Claim 11]

The composition for dust prevention according to claim 1,

wherein the composition prevents the fine dust having a particle diameter of 10um or less.

[Claim 12]

The composition for dust prevention according to any one of claim 1 to claim 11,

wherein the composition for dust prevention is a cosmetic composition.

[Claim 13]

The composition for dust prevention according to claim 12,

wherein the cosmetic composition is a softening lotion, a lotion, a cream or an essence.