Title of the Invention: Using metal nanoparticles to control the colour, lustre and iridescence of cosmetics

Abstract Title: Using metal non-spherical nanoparticles to control the colour, lustre and iridescence of cosmetic creams

The invention provides a cream comprising non-spherical nanoparticles, a method of manufacture of a cream with changeable visual properties (e.g. colour, lustre, and/or iridescence); and a method of controlling the visual appearance of a cream by exposing the cream to an electric field. The non-spherical nanoparticles may be nanorods, and the method of altering the visual appearance of the cream comprises the steps of embedding nanoparticles in a cream, forming a film of the cream having a first visual appearance, and exposing the film to an electric field to rotate the nanoparticles and transform the cream from a first visual appearance to a second altered visual appearance. The application of the electric field causes the rotation of the nanoparticle such that they become substantially aligned relative to one another. The invention relates to the field of cosmetic creams.
USING METAL NANOPARTICLES TO CONTROL THE COLOUR, LUSTRE AND IRIDESCENCE OF COSMETICS

The present invention relates to the use of nanoparticles within a cosmetic cream wherein the visual appearance of the cream can be altered by exposing the cream to an electric field.

5 BACKGROUND TO THE INVENTION

Skin types and colours vary significantly between different ethnic backgrounds, age, the level of exposure to the elements etc. and this can strongly influence the preferred choice of cosmetics for application to the skin surface. Getting good colour matching to the skin can be difficult. In addition, getting even coverage can be a problem depending on the texture and condition of the natural skin surface. Cream based cosmetics have therefore been developed to address these issues and the cream compositions developed to support the addition of pigments and conditioning agents to improve the look of the surface of the skin.

On application of the cream to the skin, the finished appearance of the skin depends on the colour, lustre and iridescence of the cream and its interaction with the skin surface e.g. levels of cream absorption into the skin, the colour of the underlying skin surface etc. In addition, the lighting in the immediate environment can also have a significant impact. For example, the high level of stage lighting when filming or performing on stage requires a different type of make-up with different properties to that used in normal day to day lighting conditions. However, the choice of cosmetics used is a compromise as, once applied to the skin, the appearance cannot be altered depending on personal preference that particular day, the natural light quality in the immediate surroundings or the various artificial lighting environments that may be encountered during the course of the day. Changing the appearance of the skin after application of the cosmetics would require removal of the cosmetics and subsequent re-application using alternative products, which is both time consuming and expensive, not to mention often impractical throughout the course of a day.

There is therefore a need for a cosmetic application whose visual appearance can be controlled to suit the preferences of the user.
SUMMARY OF THE INVENTION

The present invention seeks to address the problems of the prior art.

Accordingly, a first aspect of the present invention provides a cream comprising non-spherical nanoparticles. Preferably, the cream is a cosmetic cream.

The cream may comprise a soft-matrix material within which the non-spherical nanoparticles are embedded. The expression ‘cream’ is to be understood to include, but not be restricted to any of paste, salve, emollient, emulsion, unguent, moisturiser, foundation, cosmetic, ointment, and any other suitable cream known to the skilled person. It is also to be understood that, where the cream is a cosmetic, the cosmetic may comprise, but is not restricted to, cosmetic moisturiser, cosmetic primer, foundation, liquid foundation, cream foundation, cream eye shadow, lipstick, lip salve, lip gloss, cream blusher, cream bronzer, cream concealer, eyeliner, mascara and any other similar cosmetic known to the skilled person.

Preferably, the non-spherical nanoparticles are suspended in the cream in a random manner relative to one another. This random orientation of nanoparticles relative to one another is the natural arrangement of nanoparticles in a soft matrix.

In a preferred embodiment, the nanoparticles are nano-rods. A particular feature of non-spherical nanoparticles, such as nano-rods, is that the optical properties change as a function of viewing angle.

In one embodiment, the nanoparticles are embedded in the cream with the long axes of the nanoparticles arranged randomly relative to one another. Preferably, the cream has a first visual appearance when the long axes of the nanoparticles are oriented randomly relative to one another.

Preferably, the randomly oriented nanoparticles are operable to rotate within an electric field such that on application of an electric field, the long axes of the nanoparticles become substantially aligned relative to one another. Where the nanoparticles are nano-rods, the
nanoparticles are more efficiently aligned relative to one another compared with other non-spherical nanoparticles.

Preferably, when the long axes of the nanoparticles are substantially aligned relative to one another the cream has a second visual appearance.

In a preferred embodiment, the visual appearance of the cream can be changed from the first visual appearance to the second visual appearance on exposure of the cream to an electric field.

Preferably, the cream takes the form of a cosmetic, emollient, salve or therapeutic composition for topical application.

In one embodiment, the change in visual appearance is a change in the colour and/or lustre and/or iridescence of the cream.

A second aspect of the present invention provides a method of manufacture of a cream with changeable visual properties, the method comprising the steps of:

a. Providing an aqueous dispersal of non-spherical nanoparticles;
b. Embedding the nanoparticles in a cream such that the long axes of the nanoparticles are arranged randomly relative to each other,

wherein the visual appearance of the cream can be switched between a first visual appearance and a second visual appearance on exposure of the cream to an electric field.

A third aspect of the present invention provides a method of altering the visual appearance of a cream, the method comprising the steps of:

a. Providing nanoparticles dispersed in an aqueous or non-aqueous solution;
b. Embedding the nanoparticles in a cream;
c. Forming a film of the cream, the film having a first visual appearance;
d. Exposing the film to an electric field to rotate the nanoparticles of the matrix and transform the cream from a first visual appearance to a second altered visual appearance.
A fourth aspect of the present invention provides a method of controlling the visual properties of a cream according to a first aspect of the invention, the method comprising exposing the cream to an electric field.

5 DETAILED DESCRIPTION OF THE INVENTION

An embodiment of the invention will now be described, by way of example only.

Nanoparticles have sizes in the range 1 to 100 nm and have novel optical properties due to the specific absorption and scattering mechanisms not found in the supporting substrate alone, in this case soft matrix material. The nanoparticles exhibit strong absorption of specific wavelengths of light and this property can be made angle-dependent, leading to iridescence. The optical properties of nanoparticles can be controlled in a variety of ways, including changing the particle size, particle shape, constituent material and the carrier medium. By using a cosmetic cream as a carrier medium and controlling the optical properties of the nanoparticles as described, it is possible to control the colour, lustre and iridescence of cosmetics.

In cosmetic cream, nanoparticles assume an arrangement whereby the long axes of the nanoparticles are randomly oriented, giving the cosmetic a specific visual appearance. A particular feature of non-spherical particles, for example, nano-rods, is that the optical properties change as a function of viewing angle. Therefore, by altering the orientation of the nanoparticles it is possible to alter the visual appearance of the cosmetic.

By applying an electric field to the cosmetic, the long axes of the nanoparticles become aligned and the optical properties of the nanoparticles are changed i.e. the colour and/or lustre and/or iridescence of the cosmetic is altered. By controlling the electric field it is possible to control the degree of alignment of the nanoparticles and therefore the optical properties of the cosmetic.

Applying an electric field will induce a dipole moment in the nanoparticles and hence a torque that will rotate them to align with the field. Such an electric field could be generated by passing a charged dielectric object such as a plastic comb close to where the cream is applied thus changing the appearance as the object is passed over.
Although aspects of the invention have been described with reference to the embodiment shown in the accompanying drawings, it is to be understood that the invention is not limited to the precise embodiment shown and that various changes and modifications may be effected without further inventive skill and effort. For example, not only can the visual appearance of the cosmetic cream be changed by controlled application of an electric field, the cosmetic creams may also contain additional components to enhance their therapeutic or dermatological properties. For example, the cream may also include retinol or epidermal growth factors or other anti-aging components. Alternatively (or in addition), the cream may also contain silver nanoparticles which are powerful anti-bacterial agents which are known to have therapeutic benefits for skin conditions such as, but not limited to, impetigo.
1. A cream comprising non-spherical nanoparticles.

2. A cream according to claim 1, wherein the nanoparticles are nano-rods.

3. A cream according to claim 1 or claim 2, wherein the nanoparticles are embedded in the cream such that the long axes of the nanoparticles are arranged randomly relative to one another.

4. A cream according to claim 3, wherein the cream has a first visual appearance when the long axes of the nanoparticles are arranged randomly relative to one another.

5. A cream according to any preceding claim, wherein the nanoparticles are operable to rotate within an electric field such that the long axes of the nanoparticles become substantially aligned relative to one another.

6. A cream according to claim 5, wherein the cream has a second visual appearance when the long axes of the nanoparticles are substantially aligned relative to one other.

7. A cream according to any one of claim 6 wherein the visual appearance of the cream can be changed from the first visual appearance to the second visual appearance on exposure of the cream to an electric field.

8. A cream according to claim 8 wherein the change in visual appearance is a change in the colour and/or lustre and/or iridescence of the cream.

9. A cream according to claim any preceding claim, wherein the cream is provided in the form of an emollient, salve or therapeutic composition for topical application.
10. A method of manufacture of a cream with changeable visual properties, the method comprising the steps of:
   a. Providing an aqueous dispersal of non-spherical nanoparticles;
   b. Embedding the nanoparticles in a cream such that the long axes of the nanoparticles are arranged randomly relative to each other,

wherein the visual appearance of the cream can be switched between a first visual appearance and a second visual appearance on exposure of the cream to an electric field.

11. A method of altering the visual appearance of a cream, the method comprising the steps of:
   a. Providing nanoparticles dispersed in an aqueous solution;
   b. Embedding the nanoparticles in a cream;
   c. Forming a film of the cream, the film having a first visual appearance;
   d. Exposing the film to an electric field to rotate the nanoparticles of the matrix and transform the cream from a first visual appearance to a second altered visual appearance.

12. A method of controlling the visual properties of a cream according to any one of claims 1 to 9, the method comprising exposing the cream to an electric field.
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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<th>Category</th>
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<td>X</td>
<td>1-12</td>
<td>JP 20061111675 A (MITSUBISHI MATERIALS CORP) - See entire document, particularly the English language WPI/EPODOC abstracts (WPI accession number 2006-323842), and paragraphs [0005], [0011], and [0018].</td>
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<td>DE102004042012 A1 (MERCK PATENT GMBH) - See entire document, particularly the English language EPODOC/WPI abstracts (WPI accession number 2006-205631).</td>
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<td>KR20140000498 A (KOLMAR KOREA) - See entire document, particularly the English language EPODOC/WPI abstracts (WPI accession number 2014-B57248).</td>
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<td>WO2007/011103 A1 (KOREA RESEARCH INSTITUTE OF BIOSCIENCE AND BIOTECHNOLOGY) - See entire document, particularly the abstract, page 5, lines 4-9, page 8, lines 4-8, the examples and the claims.</td>
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Categories:

- X: Document indicating lack of novelty or inventive step
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- &: Member of the same patent family
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Field of Search:

- Search of GB, EP, WO & US patent documents classified in the following areas of the UKC: X
- Worldwide search of patent documents classified in the following areas of the IPC: A61K; A61Q; B82Y
- The following online and other databases have been used in the preparation of this search report: EPODOC, WPI, BIOSIS, MEDLINE, INTERNET
**International Classification:**

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