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Title: PIGMENTED LIQUID CRYSTAL MATERIALS

Abstract: A cosmetic composition comprising a pigment material and a liquid crystal material wherein the pigment is mixed directly with the liquid crystals prior to formulation with other cosmetic ingredients, to obtain a novel visual effect.
PIGMENTED LIQUID CRYSTAL MATERIALS

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a novel composition of pigmented materials for use in cosmetics products, such as makeup for applying to the skin, of the face or the body, or other cosmetic treatments for the nails, eyelashes, eyebrows or hair, and lips, for example, nail enamel or polish, lipstick, mascara, eye shadow and the like, to provide moisture and enhanced visual effects.

DESCRIPTION OF RELATED ART

It is commercially desirable to provide cosmetics which have unique decorative, functional and aesthetic effects. These effects are often achieved through the use of colorants, glasses, or other products which provide pearlescent, luminescent, or reflective effects when mixed into cosmetics. However, most of these products need to be viewed against a dark background to achieve these decorative effects. It is particularly desirable to have a product to achieve these effects which can be used in conjunction with conventional makeup without changing the aesthetic effects (such as color or shininess). Liquid Crystals which are esters of cholesterol simultaneously exhibit properties of an isotropic liquid and a crystalline solid. When oriented, these crystals can provide distinct visual effects and can dramatically change their appearance in response to an applied electric field. Such orientation and electric fields are of course not available for cosmetic materials whose particles are randomly organized. A further difficulty in releasing the potential visual properties of liquid crystals in the cosmetic arts is that the translucent nature of the liquid crystal material results in a substantial loss of the visual properties of the liquid crystal material in randomized mixtures such as typical cosmetic compositions.

Mixtures of Cholesteric Liquid Crystal (CLC) compounds exhibit dramatic visual color play and a high level of iridescence when viewed against a dark background. However, when viewed without a background or a light background the CLC’s lose the majority of the effect due to the translucent nature of the material.

El-Nokaly, U.S. Patent No. 5,843,407 teaches lipstick compositions which comprise wax, emollient and a gelling agent wherein the inclusion of the gelling agent facilitates the retention of emollient oils particularly under high humidity and temperatures. The disclosed lipsticks contain moisturizers which may be delivered to the lips in a non-polar/lipophilic medium in a thermodynamically stable way by
using associated structures. A method of making the lipstick is also disclosed. Liquid crystal structures
referenced as "association structures" are used in the lipsticks. The lipstick compositions are designed
to deliver emollients to the lips while avoiding oil from collecting on the outer surface of said lipstick,
particularly when said stick is subjected to high humidity.

Hao, U.S. Patent No. 5,847,791 discloses a reflective color liquid crystal comprising a guest-host liquid
crystal display, a color filter and a reflector. The reflector is a simple mirror-like reflection surface. The
color filter is manufactured with a pigment dispersion method. The particle size of the pigment is
reduced to provide strong light forward scattering and weak light back scattering. The color filter
provides light colors for the display as well as light scattering to increase the viewing angle for the
display.

T. L. Smith et al., U.S. Patent No. 5,932,309 discloses the physics of colored materials and of the
respective optical effects attributable to plate-like interference colorants and particle scattering
colorants. Methods and compositions for achieving material coloration using particle scattering are
disclosed. According to Smith, these coloration effects can be designed to be either highly stable or
dependent upon the switching effects of either temperature, integrated thermal exposure, moisture
absorption, or exposure to actinic radiation. Articles employing materials with these coloration effects
are described. Compositions comprising a solid, light-transmitting matrix component having a non-
liquid particle scattering colorant dispersed therein. Articles are produced wherein another solid second
matrix component has an electronic transition colorant dispersed therein and the first and second
compositions are disposed on one another and optionally interpenetrate each other. Colored articles are
produced in the form of fibers, films and molded articles.

Ukita et al., U.S. Patent No. 5,940,154 discloses the introduction of pigments into liquid crystals,
specifically in an active matrix display. The references to individual molecules suggest Ukita may have
contemplated soluble dyes rather than insoluble pigment particles. The above-mentioned reflection type
liquid crystal display makes it possible to provide improved light diffusion and reflection functions
without special techniques. In particular, Ukita claims that it is possible to reduce the number of
photolithography steps for fabricating an active matrix type substrate, for lower fabrication costs and a
higher fabrication yield.

SUMMARY OF THE INVENTION

It is an object of the invention to provide cosmetics products, with the unique visual properties
associated with pigmented liquid crystals. The present invention comprises a composition of coloring
agent and liquid crystal material which are mixed prior to being introduced to a product. The colored liquid crystals may also be further combined with the same or different coloring agent. The introduction of the present invention to a product alters the color and/or radiance that the product will subsequently convey.

10 Cosmetic products are so well-suited as vehicles for the present invention that cosmetic products will be utilized as illustrative examples of some of the many possible applications of the present invention. The present invention may be added to enhance, contrast or combine with the existing color of the vehicle. The present invention may also be used to provide color and radiance to a transparent vehicle. As a result, the present invention can increase the usefulness and versatility of existing products.

15 Furthermore, the present invention inspires creativity and artistry by allowing its user to create original preparations as they see fit.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

20 The present invention teaches adding a visual-enhancing composition, comprising a coloring agent mixed directly with liquid crystals, to a vehicle such as a cosmetic product, to obtain unique decorative, functional and aesthetic effects, namely dramatic color play and/or a high level of iridescence. Preferably, the present invention is to be combined with cosmetic products, either during manufacture or by the consumer after purchase. Therefore, to accommodate such needs, the present invention may be sold in small quantities for retail or in bulk for manufacture.

The coloring agents can be lakes, inorganic or organic pigments and/or pearlescent pigments or alternatively colorants. Pigments which are stable and do not generate much free radicals are preferred.

30 In addition to pigmented liquid crystals, the present invention may comprise other visually-enhancing materials, or particularly in the case of cosmetics, nutrients for improving appearance. Polymer colored articles of the present technology can also contain fillers, processing aids, antistats, antioxidants, antiozonants, stabilizers, lubricants, mold release agents, antifoggers, plasticizers, and other additives standard in the art. Unless such additives additionally serve desired purposes as particle scattering colorants or electronic transition colorants, such additives should preferably either dissolve uniformly in the polymer that contains the particle scattering colorant or such additives should have a degree of transparency and a refractive index similar to the matrix polymer. Dispersing agents such as surfactants are especially useful in the present invention for dispersing the particle scattering colorant particles. Surfactants or emulsifiers are divided into nonionic (no charge), anionic (negative charge), cationic (position charge) and amphoteric (both charges) based on whether or not they ionize in aqueous media.
Surfactants are derived from natural oils and fats and crude oils. The term "surfactant" as used herein refers to mixtures of surfactants as well as a single organic compound. Many suitable dispersing agents and other polymer additives are well known in the art. Coupling agents that improve the coupling between particle scattering particles and host matrix are especially important additives for vanishing. For cases where either a glass or a ceramic is the particle scattering colorant, and the host matrix is an organic polymer, preferred coupling agents are various silanes that are commercially available and designed to improve bonding in composites that involve both inorganic and organic phases.

Generally, the relative amounts of pigment and liquid crystal are dependant on the intended color and/or amount of radiance desired. However, the mixing of the pigment and liquid crystals renders a color to the liquid crystals, thus making it possible to make a visual impact with the colored crystals, without adding or changing the color of the vehicle. For this effect, using relatively small amounts of pigment is preferred. Larger amounts of pigment are preferred when enhanced color play is desired. Generally, the amounts range from 0.001 to 20% of the total.

Additionally, flavor or fragrance oils such as peppermint oil, orange oil, citrus oil, or wintergreen oil can be used along with an alcohol or glycerine. Flavor oils are usually mixed in a solvent such as ethanol to dilute the flavor. The flavor oils useful herein can be derived form natural sources or be synthetically prepared. Generally, flavor oils are mixtures of ketones, alcohols, fatty acids, esters and terpenes. The term "flavor oil" is generally recognized in the art to be a liquid which is derived from botanical sources, i.e. leaves, bark, or skin of fruits or vegetables, and which are usually insoluble in water.

Liquid crystals that are esters of cholesterol are preferred, particularly when the present invention is used with an aqueous vehicle. Additionally, these cholesteric liquid crystals (CLCs) are useful for skin repair, as they are taken up with the skin and may be used as carriers for various nutrients. CLCs also possess properties of both isotropic liquids and crystalline solids, which in effect, exhibit dramatic visual color play and a high level of iridescence. CLC mixtures in accordance with the present invention can be used to provide unique decorative, functional and aesthetic effects.

Probably the most dramatic way to view CLCs is against a dark background. However, without a background, or with a light-colored background, the CLCs lose the majority of their visual effect due to the translucent nature of the material. Therefore, the present invention contemplates an embodiment that creates its own dark background by grinding a small amount of pigment into the CLC, thus vastly increasing the visual impact without the use of a dark background and without imparting color to the skin. The amounts would be 0.001 to 50 wt%, preferably as little as .05 wt% and as great as .5 wt%.
An alternative embodiment of the present invention comprises pigmented liquid crystals, formulated through mixing of pigment material and liquid crystals, and further combining another pigment material. Thus, the effect of adding the embodiment just described to a vehicle can be to change the vehicle’s color to a first color, while also adding liquid crystals of a second color. Also, further colors may combined during the formation to achieve desirable shades or color mixes. Pigment sizes generally range from 0.001-3 μg.

It is also understood that the composition may further comprise an emollient component to aid application and adhesion, yield gloss and most importantly provide occlusive moisturization. Skin care active ingredients in both water soluble and water insoluble forms include fat soluble vitamins such as vitamin A and E, sun screens and pharmaceutically active ingredients. These skin care active ingredients include zinc oxide, chamomile oil, gingko biloba extract; pyroglutamic acid, salts or esters; sodium hyaluronate; 2-hydroxyoctanoic acid; sulfur; salicylic acid; carboxymethyl cysteine, and mixtures thereof. Other skin conditioning agents including emollients, humectants, occlusives, and other miscellaneous ingredients which condition the skin including oils. Said emollient component typically comprises from about 5% to about 90%, preferably from about 25% to about 90%, and most preferably from about 70% to about 90% oils. Oils are those materials which are organic substances that are liquid at ambient temperature. They are esters, triglycerides, hydrocarbons and silicones. These can be a single material or a mixture of one or more materials. The oils act as emollients and also impart desirable skin feel characteristics and viscosity. Suitable oils include caprylic triglycerides; capric triglycerides; isostearic triglycerides; adipic triglycerides; propylene glycol myristyl acetate; lanolin; lanolin oil; polybutene; isopropyl palmitate; isopropyl myristate; isopropyl isostearate; diethyl sebacate; diisopropyl adipate; tocopheryl acetate; tocopheryl linoleate; hexadecyl stearate; ethyl lactate; cetyl oleate; cetyl ricinoleate; oleyl alcohol; hexadecyl alcohol; octyl hydroxystearate; octyl dodecanol; wheat germ oil; hydrogenated vegetable oils; petralatum; modified lanolins; branched-chain hydrocarbons; alcohols and esters; corn oil; cottonseed oil; olive oil; palm kernel oil; rapeseed oil; safflower oil; jojoba oil; evening primrose oil; avocado oil; mineral oil; sheabutter; octyl palmitate; maleated soybean oil; glycerol trioctanoate; diisopropyl dimerate; volatile and non-volatile silicone oils including phenyl trimethicone; isostearic acid derivatives, isopropyl palmitate, surfactants, lanolin oil, diisopropyl dimerate, maleated soybean oil, octyl palmitate, isopropyl isostearate, octyl hydroxy stearate, cetyl lactate, cetyl ricinoleate, tocopheryl acetate, acetylated lanolin alcohol, cetyl acetate, lecithin, phenyl trimethicone, glyceryl olate, tocopheryl linoleate, wheat germ glycerides, arachidyl propionate, isopropyl palmitate, myristyl lactate, decyl olate, propylene glycol ricinoleate, isopropyl lanolate, pentaerythrityl tetra stearate, neopentylglycol dicaprylate/dicaprate, hydrogenated coco-glycerides, isostrideyl isononanoate, isononyl isononanoate, myristal myristate, triisocetyl citrate, cetyl alcohol, octyl dodecanol, oleyl alcohol, panthenol, lanolin alcohol, linoleic acid, linolenic acid and mixtures thereof. Excess polar and nonpolar
solvents used to forming surfactant association structures can be used as emollients, particularly the polar solvents such as glycerine. Other preferred polar solvent emollients include pyrrolidone carboxylic acid, sodium lactate or lactic acid, urea collagen, \( \alpha \)-hydroxy propylglyceryl ether \( \alpha \)-hydroxy acids (e.g., ethylglycolic acid, leucic acid, mandelic acid, glycollic acid), glucosamines, and elastin fibers, D-panthenol, alkantoin and hyaluronic acid and chondroitin sulfate. Please note that some of these can be delivered with the association structures by dissolving into the polar liquid.

The present invention affords a great deal of possible arrangements of color and/or radiance. Some examples of the many possible formulations and uses of the present invention are illustrated below.

METHOD OF MANUFACTURE

The manufacture of pigmented liquid crystals is done by dispersing organic or inorganic pigment into a liquid crystal with a propeller type mixer, pigment concentration can be from 0.001 to 50%. Hydrophobic fumed silica (2%) is added to prevent agglomeration of pigment. Without the fumed silica, the small amount of dark pigment agglomerate and will not evenly distribute within the liquid crystal and then will show a dark, splotchy spot without allowing the iridescent effect to come forth. Once dispersed the liquid crystal/pigment blend is milled by three roll mill or other high shear equipment until the pigment is fine enough to read less than seven on a Hegman gauge, which corresponds to a measure of particulate size that should not be detectable by touch. The particle size of the pigment must be fine enough so that the dark background needed to achieve the iridescent effect is not visible to the naked eye.

Example 1

A small amount of D&C Red No. 28 Aluminum Lake is added to a red liquid crystal (formed through the combination of Cholesteryl Oleylcarbonate, Cholesteryl Nonanoate and Cholesteryl Chloride). The resultant liquid crystal is pink in color with a preliminary red reflection for use as a blush or a light foundation.

<table>
<thead>
<tr>
<th>Component</th>
<th>wt%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Liquid Crystal</td>
<td>99.95</td>
</tr>
<tr>
<td>D&amp;C Red No. 28 Aluminum Lake</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Example 2

A purple liquid crystal with a predominantly blue reflection is formed with the following materials. The purple base may be used to counteract a yellowish tint to the skin.

<table>
<thead>
<tr>
<th>Component</th>
<th>wt%</th>
</tr>
</thead>
</table>
Example 3

A red liquid crystal with a predominantly green reflection can be formed in the following manner.

<table>
<thead>
<tr>
<th>Component</th>
<th>wt%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Liquid Crystal</td>
<td>99.50</td>
</tr>
<tr>
<td>D&amp;C Red No. 7 Calcium Lake</td>
<td>0.50</td>
</tr>
</tbody>
</table>

100.00

While some illustrative embodiments of the invention have been described above, it is, of course, understood that various modifications will be apparent to those of ordinary skill in the art. Such modifications are within the spirit and scope of the invention, which is limited and defined only by the appended claims.
Claims

1. A composition for application to an object comprising:
   a) a plurality of cholesteric liquid crystals in admixture with
   b) at least one coloring agent characterized in that the coloring agent is in an amount of
   sufficient to provide a dark enough background to allow the crystals to exhibit an iridescent effect while
   not changing the color of the object when the crystals are applied to the object.

2. A composition for adding an iridescent effect to a cosmetic product comprising:
   a) a plurality of cholesteric liquid crystals in admixture with
   b) at least one coloring agent characterized in that the coloring agent is in an amount of
   sufficient to provide a dark enough background to allow the crystals to exhibit the iridescent effect
   wherein the composition does not alter the color of the cosmetic product.

3. A pre-mixed composition for combining with and adding an iridescent effect to a cosmetic
   product, comprising:
   a) a plurality of cholesteric liquid crystals in admixture with
   b) at least one coloring agent characterized in that the coloring agent is in an amount of
   sufficient to provide a dark enough background to allow the crystals to exhibit the iridescent effect
   wherein the composition does not alter the color of the cosmetic product.

4. A method of adding an iridescent effect to a cosmetic product, comprising the following steps:
   a) mixing an amount of at least one coloring agent with a plurality of cholesteric liquid crystals
      to form a first composition; and
   b) combining said first composition with said cosmetic product
      characterized in that the coloring agent is in an amount of sufficient to provide a dark enough
      background to allow the crystals to exhibit the iridescent effect while the composition does not alter the
      color of the cosmetic product.

5. A method of adding an iridescent effect to a non-cosmetic product, comprising the following
   steps:
   a) mixing an amount of at least one coloring agent with a plurality of cholesteric liquid crystals
      to form a first composition; and
   b) combining said first composition with said non-cosmetic product
characterized in that the coloring agent is in an amount of sufficient to provide a dark enough background to allow the crystals to exhibit the iridescent effect while the composition does not alter the color of the non-cosmetic product.

6. A cosmetic composition for application to the skin comprising:

a) a cosmetic product, whereby said cosmetic product is capable of being applied to the skin; and

b) a composition comprising at least one coloring agent in combination with a plurality of cholesteric liquid crystals

characterized in that the composition does not alter the color of the cosmetic product and the coloring agent is in an amount of sufficient to provide a dark enough background to allow the crystals to exhibit an iridescent effect.

7. A cosmetic composition comprising a pigment material and a plurality of cholesteric liquid crystals characterized in that the pigment is mixed directly with the liquid crystals prior to formulation with other cosmetic ingredients, to obtain an iridescent effect wherein the composition does not alter the color of the cosmetic product and the coloring agent is in an amount of sufficient to provide a dark enough background to allow the crystals to exhibit an iridescent effect.

8. A process comprising:

a) dispersing an organic or inorganic pigment into a plurality of cholesteric liquid crystals with a propeller type mixer to form a liquid crystal/pigment blend; and

b) milling said liquid crystal/pigment blend by high shear equipment until the pigment is fine enough to read less than seven on a hegemon gauge

wherein the blend is a clear color.

9. A process according to claim 8 characterized in that the concentration of said pigment is between 0.001 to 50wt%.

10. The product of the process according to claim 8.

11. The product of the process according to claim 9 incorporated into a cosmetic formulation.
12. A process according to claim 8 characterized in that it further comprises a step of adding fumed silica before milling to prevent agglomeration of pigment.

13. A process according to claim 12 characterized in that the amount of fumed silica added is about 2%.

14. The product of the process according to claim 12.

15. A process comprising:
   a) dispersing an organic or inorganic pigment into a plurality of cholesteric liquid crystals with a propeller type mixer to form a liquid crystals/pigment blend;
   b) adding hydrophobic fumed silica before milling to prevent agglomeration of pigment in the liquid crystals/pigment blend;
   c) milling said liquid crystals/pigment blend by high shear equipment until the pigment is fine enough to read less than seven on a hegmen gauge.

16. A process according to claim 15 characterized in that the amount of fumed silica added is about 2%.

17. The product of the process according to claim 15.

18. A cosmetic composition comprising:
   a) a dark pigment material in admixture with a plurality of cholesteric liquid crystals wherein the pigment is mixed directly with the liquid crystals to provide a first mixture
   b) a light colored cosmetic product having a first color mixed with the first mixture to provide a second mixture;
wherein the second mixture has an iridescent effect and is still the same color as the light colored cosmetic product.

19. A process according to claim 8 wherein the concentration of said pigment is between 0.05 to 0.5wt%.