Abstract:
Title: AQUEOUS VEHICLE FOR COLORED COMPOUNDS AND PIGMENTS. WATER-BASED NAIL POLISH COMPRISING SAID VEHICLE, AND A PROCESS FOR THEIR PRODUCTION

Described herein are a water-based vehicle for colored compounds and pigments, useful for the preparation of decorative and/or coloring compositions, both for the application to objects and for use in cosmetics; nail polishes obtained by using said water-based vehicle; and a process for the production of both the vehicle and the final decorative and/or coloring compositions.
AQUEOUS VEHICLE FOR COLORED COMPOUNDS AND PIGMENTS, WATER-BASED NAIL POLISH COMPRISING SAID VEHICLE, AND A PROCESS FOR THEIR PRODUCTION

Field of the Invention

The present invention relates to a water-based vehicle for colored compounds and pigments, useful for the preparation of decorative and/or coloring compositions, both for the application to objects and for use in cosmetics; in particular, the vehicle is used for the preparation of water-based nail polishes. The invention also concerns processes for the production of both the vehicle and the final decorative and/or coloring compositions.

State of the Art

Transparent and coloring compositions can be broadly used both in industry, for coating finished products, and in daily life applications, for example for coloration or decoration of single objects (for example in the DIY field or in the art of modelling), in the fine arts, or in cosmetics, particularly in nail polishes.

These compositions generally consist of a solvent or liquid suspending medium, in which one or more coloring compounds or pigments (a term which normally means coloring substances in the form of powders) may or may not be dissolved or dispersed; the coloring compositions almost always comprise other components with specific functions, such as promoting miscibility of the coloring substance in the liquid (or maintaining it in suspension in the case of pigments), extending the "shelf-life" of the product, or giving the product an optimal rheology (for example by improving its spreadability).

Once the composition has been applied, the liquid evaporates leaving a deposit, usually thin, of the transparent or coloring compound; in these compositions, the liquid then acts as a vehicle for the transparent or coloring compound or the pigment.

The vehicle is very often an organic compound. Organic compounds advantageously provide an extreme variation of chemical-physical characteristics and therefore are easily adaptable to function as a vehicle for dyes or pigments of any type; furthermore, organic liquids often have reduced evaporation times, thus
aiding the drying of the layer of applied color. Despite these undoubted technical advantages, the use of organic compounds as a vehicle in coloring compositions, however, is less and less accepted by end users because vapors of these solvents are often unpleasant and irritating if inhaled in excessive quantities. Furthermore, due to the greater or lesser toxicity of nearly all organic compounds, their use is subject to increasing regulatory restrictions.

In recent years research in this field addressed the development of transparent and coloring water-based compositions. In this case, the liquid medium is by definition non-toxic, but the drying time of the coated layer is often long, even about an hour, and such as not to be optimal or suitable for some applications; for example, in the case of nail polish, similar drying times are often considered unacceptable.

In recent years, Interpolymer Corporation, a company of Canton, Massachusetts (USA) has developed formulations based on acrylic polymers in water, which solve in part the problems highlighted above.

In a presentation on the Internet, available at:
http://www.cosmesi.it/Portals/7/Documenti/Syntran%20PC5620_New%20polymer%20for%20waterbased_Presentation.pdf

are described water-based enamels employing the acrylic copolymers Syntran® PC 5620 and Syntran® KL21 9-CG, both being produced by Interpolymer Corp. (owner of the brand Syntran®). The presentation shows various possible compositions of the enamel (or rather, the basis of the enamel, that is a clear enamel to which the desired pigments or dyes can be added), including F-91-141 B, which is referred to as the best one. This composition contains (by weight) 92% of an aqueous solution of the copolymer Syntran® PC 5620, 2.4% of dipropylene glycol dibenzoate, 4.4% of propylene glycol n-butyl ether and 1.2% of the copolymer Syntran® KL21 9-CG.

Composition F-91-141 B results to have a drying time of less than a quarter of an hour, less than that of other water-based enamels, and high gloss already after coating the first layer of enamel.

However, the drying time indicated above for enamel F-91-141 B is still relatively long; furthermore, this enamel is too fluid, thus its spreading is not
straightforward and requires precision, and the nail must be kept steady while the 
enamel is applied, to prevent smudging. Enamel F-91-141B and other formulations 
available from Interpolymer Corporation cause similar problems even if used for 
different applications, for example for decoration of objects or in the field of fine 
arts.

Accordingly, it is still felt in the field the need of having available transparent 
and coloring water-based compositions overcoming the problems of those 
currently on the market, in particular, that exhibit more rapid drying times and can 
be coated in easier and more controllable way than the water-based compositions 
currently available.

Summary of the Invention

The object of the present invention is to provide a water-based liquid vehicle 
for transparent and coloring compositions, as well as a nail polish comprising said 
vehicle capable of overcoming the above mentioned drawbacks of the 
compositions currently on the market; the invention also provides a method for the 
production of said vehicle and nail polish.

This object is achieved by the present invention, which, in a first aspect, 
relates to a vehicle, V, for transparent and coloring compositions, comprising:

- 100 parts by weight of a first component, A, which consists of the product 
  Syntran® PC 5620, an aqueous solution of an acrylic copolymer at a 
  concentration between 40 and 45% by weight;

- between 7 and 10 parts by weight of a second component, B, consisting of 
  15% by weight of the product Syntran® KL21.9-CG and at least two 
  compounds selected from: an ether or an ester of dipropylene glycol in an 
  amount up to 50% by weight, propylene glycol n-butyl ether in an amount 
  up to 60% by weight, an ether or an ester of butylene glycol in an amount 
  up to 12% by weight, tripropyleneglycol methyl ether in amounts up to 
  50% by weight and n-butyl ester of glycolic acid and ethers derivatives 
  thereof in amounts up to 60% by weight; and

- between 2 and 6 parts by weight of a third component, C, consisting of an 
  aqueous solution of bentonite at a concentration between 5 and 20% by 
  weight.
The vehicle V may also contain, optionally and preferably, glycerol in an amount in the range of 0.01 to 2 parts by weight per 100 parts by weight of the sum of components A, B and C.

In a second aspect thereof, the invention relates to a nail polish comprising the vehicle V described above and between 0.4% and 5% by weight, relative to the overall composition of the nail polish, of a pigment or a dye component.

Finally, in a third aspect thereof, the invention relates to the process for the production of the carried and the nail polish described above, which comprises the following steps:

- adding component B to component A, under slow stirring, in a time between 20 minutes and 1 hour;
- adding component C, slowly and under stirring, to the mixture of components A and B.

The sequence of operations outlined above for the preparation of the vehicle is preferably carried out under reduced pressure condition, for example between 0.1 and 0.4 bar.

**Detailed Description of the Invention**

Features and advantages of the invention will be illustrated in detail in the following description.

The invention relates to transparent and coloring compositions, particularly suitable for use as water-based nail polish, comprising only water-based raw materials approved by the regulations of the Food and Drug Administration (FDA, the US government agency responsible for monitoring safety of foods, drugs and chemical compounds in general); in particular, the compositions of the invention do not contain butyl acetate, ethyl acetate, acetone, ammonia, camphor, dibutyl phthalate, formaldehyde, heavy metals, nitrocellulose, parabens, non-ionic soaps and toluene.

In a first aspect thereof, the invention relates to the vehicle for coloring compositions, V, formed by a first component A, a second component B, a third component C, and optionally glycerol.

The first component, A, is Syntran® PC 5620, which comprises 40 to 45% by weight of an acrylic copolymer, while the remaining part is water. This component,
when properly formed, has a pH value between 7 and 8.

The second component B comprises Syntran® KL21 9-CG and at least two plasticizers different from each other, dissolved in water.

The product Syntran® KL21 9-CG consists of an aqueous solution containing 72 to 75% by weight of water, 20 to 24% by weight of a second acrylic copolymer, different from that contained in product Syntran® PC 5620, and lower percentages of further additives.

Plasticizers are organic compounds, generally esters or ethers, which are added to polymeric materials, in order to improve their processability and/or to give them flexibility and softness characteristics, and sometimes higher resistance to low temperatures, weathering and combustion. For the purposes of the invention, it was observed that at least two plasticizer compounds must be used in component B, which are selected from ethers or esters of propylene glycol, dipropylene glycol, tripropylene glycol or butylene glycol. These compounds are commercially available.

Preferably, component B has the following composition: 15% by weight of the product Syntran® KL21 9-CG, 25% by weight of dipropylene glycol dibenzoate, 40% by weight of propylene glycol n-butyl ether and 20% by weight of n-butyl ester of glycolic acid, or of a mixture of the latter with ethers derived therefrom, that is, n-butyl ester butoxyacetic acid and di-n-butyl ester of diglycolic acid; as n-butyl ester of glycolic acid and its derivatives the product Polysolvan O® can be employed, produced and sold by Celanese Chemicals.

Finally, the third essential component of the vehicle of the invention, C, is a suspension of bentonite, a commercially available natural clay; this clay is sold, for example, under the name Bentone® EW by the British company Elementis pic.

Preferably, glycerol in an amount between 0.01 and 2 parts by weight is also added to 100 parts by weight of the vehicle of the invention, formed as described above; adding glycerol promotes applicability and stability of the product, in addition to exercising an antiseptic and moisturizing action.

In addition to being a water-based liquid medium suitable for coloring compositions of various types and for different applications, the vehicle V with the composition described above, has, except for the color, all the characteristics of a
transparent polish nail, including shininess.

Furthermore, the inventors have found that, compared to enamel F-91-141B of the prior art, the vehicle V (or transparent enamel) of the invention has a greatly reduced drying time, about two minutes (thus better also than the solvent based enamels) and a lower fluidity in the liquid phase, which enables to better control the application.

This vehicle can be used for the realization of the second aspect of the invention, relating to a colored nail polish. In addition to the above mentioned vehicle V, this nail polish comprises 0.4% to 5% by weight of pigments or liquid coloring compounds. In particular, for the preparation of transparent interference nail polish (which give rise to a characteristic iridescence effect) the final nail polish comprises 2 to 5% by weight of interference pigments; for the preparation of transparent colored nail polish the final nail polish comprises 0.4 to 2% by weight of a transparent dye in liquid form; for the preparation of interference transparent colored nail polish the final nail polish comprises 2 to 5% by weight of interference pigments and 0.4 to 1.6% by weight of a transparent dye in liquid form; and for the preparation of opaque lacquer colored nail polish the final nail polish comprises 2 to 4% by weight of colored pigments. These pigments and liquid dyes are well known to the technician of the field.

Finally, in its last aspect, the invention relates to a process for the preparation of the vehicle and the final nail polish.

The essential steps of the procedure have been reported previously.

All steps of the process must be carried out with mild agitation, to prevent air from being incorporated into the composition, which would be difficult to remove thereafter, and whose presence in the vehicle or in the final nail polish would result in opacity or formation of bubbles during application or the following drying, with unsatisfactory aesthetic results. To prevent air from being incorporated, the process steps can possibly be carried out under a partial vacuum, for example at a pressure ranging from 0.1 to 0.4 bar. Unlike what has been described in the above mentioned on-line presentation of Interpolymer Corporation, operating under reduced pressure conditions enables to directly mix components A to C, and optionally glycerol, in the desired proportions, and then also add the pigments or
coloring components.

As mentioned above, component A is available commercially, it being a product sold by the company Interpolymer Corporation under the name Syntran® PC 5620.

In the first step of the process of the invention, component B is prepared separately in a second vessel by adding the plasticizers to the copolymer in the desired ratio, slowly and under stirring; then component B is added to component A under slow stirring, for example by means of a vertical agitator with asymmetric blades; the addition of component B to component A requires a time in the range of 20 minutes to 1 hour.

Component C is prepared separately by adding a predetermined quantity of water to the bentonite under slow stirring, until a clear suspension is obtained; component C so prepared is then added to the mixture of components A and B, slowly and under stirring.

Finally, the optional component glycerol may be added, in the quantities indicated above, always under slow stirring.

With this procedure (with or without the addition of glycerol) the preparation of the vehicle V of the invention is completed.

For the preparation of colored nail polishes, pigments or dyes are added to said vehicle in the amounts given above, under slow stirring continued for about 20-40 minutes; preferably, stirring may be interspersed with steps in which the composition is treated by using grinding elements, aimed in particular at causing breakdown of agglomerates of solid pigments.
CLAIMS

1. A vehicle, V, for transparent and colouring compositions, comprising:
   - 100 parts by weight of a first component, A, which consists of the product Syntran® PC 5620, an aqueous solution of an acrylic copolymer in a concentration between 40 and 45% by weight;
   - between 7 and 10 parts by weight of a second component, B, consisting of 15% by weight of the product Syntran® KL21 9-CG and at least two compounds selected from: an ether or an ester of dipropylene glycol in an amount up to 50% by weight, propylene glycol n-butyl ether in an amount up to 60% by weight, an ether or an ester of butylene glycol in an amount up to 12% by weight, tripropylene glycol methyl ether in amounts up to 50% by weight and n-butyl ester of glycolic acid and ethers derivatives thereof in amounts up to 60% by weight; and
   - between 2 and 6 parts by weight of a third component, C, consisting of an aqueous solution of bentonite at a concentration between 5 and 20% by weight.

2. A vehicle according to claim 1, wherein component B has the following composition by weight: 15% of the product Syntran® KL21 9-CG, 25% by weight of dipropylene glycol dibenzoate, 40% by weight of propylene glycol n-butyl ether and 20% by weight of n-butyl ester of glycolic acid, or a mixture of the latter with n-butyl ester of butoxyacetic acid and di-n-butyl ester of diglycolic acid.

3. A vehicle according to any one of the preceding claims, further containing glycerol in an amount between 0.01 and 2 parts by weight per 100 parts by weight of the sum of components A, B and C.

4. A nail polish containing the vehicle of any one of claims 1 to 3, and between 0.4% and 5% by weight, relative to the overall composition of the nail polish, of a pigment or a dye component.

5. A nail polish according to claim 4, of the transparent interference type, containing between 2% and 5% by weight of an interference pigment.

6. A nail polish according to claim 4, of the transparent colored type, containing between 0.4% and 2% by weight of a transparent dye in liquid form.
7. A nail polish according to claim 4, of the transparent colored and interference type, containing between 2% and 5% by weight of an interference pigment, and between 0.4% and 1.6% by weight of a transparent dye in liquid form.

8. A nail polish according to claim 4, of the colored opaque lacquer type, containing between 2% and 4% by weight of colored pigments.

9. A process for the production of the vehicle of any one of claims 1 to 3, which comprises the following steps:
   - mixing a first component, A, formed by the product Syntran® PC 5620 and a second component, B, consisting of 15% by weight of the product Syntran® KL219-CG and at least two compounds selected between an ether or an ester of dipropylene glycol in an amount up to 50% by weight, propylene glycol n-butyl ether in an amount up to 60% by weight, an ether or an ester of butylene glycol in an amount up to 12% by weight, tripropylene glycol methyl ether in an amount up to 50% by weight and n-butyl ester of glycolic acid, or a mixture of the latter with n-butyl ester of butoxyacetic acid and di-n-butyl ester of diglycolic acid, in an amount up to 60% by weight, adding an amount ranging from 7 to 10 parts by weight of component B to 100 parts by weight of component A, under slow stirring, in a time between 20 minutes and 1 hour;
   - adding to the mixture of components A and B, slowly and under stirring, 2 to 6 parts by weight of a third component, C, consisting of an aqueous solution of bentonite at a concentration between 10 and 20% by weight.

10. A process according to claim 9, further comprising the step of adding glycerol to the mixture of components A, B and C, slowly and under stirring, in an amount in the range of 0.01 and 2 parts by weight per 100 parts by weight of the sum of components A, B and C.

11. A process according to any one of claims 9 or 10, further comprising the step of adding to said vehicle between 0.4% and 5% by weight, relative to the weight of the final overall composition, of a pigment or a dye component.

12. A process according to any one of claims 9 to 11, wherein said steps are carried out under conditions of reduced pressure.

13. A process according to claim 12, wherein said steps are carried out at a
pressure between 0.1 and 0.4 bar.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61Q3/02 A61K8/81 A61K8/34

According to International Patent Classification (IPC) and both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols) A61Q A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

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