

Description

TECHNICAL FIELD

The present invention is directed to preparation of inks employed in ink-jet printing, and, more particularly, to an improved process for preparing ink compositions used in thermal ink-jet printing.

BACKGROUND ART

In a modern thermal ink-jet printhead device, resistors used to propel bubbles of ink toward the paper substrate must be able to fire for millions of times without failure. In thermal printhead printing, the purity and chemical structure of the dye in the ink can radically affect the printhead operation, resulting in resistor failure or nozzle clogging.

Changing the cation of the dye molecule improves the solubility of the dye molecule in the solvent, which prevents crusting (clogging of the printhead nozzle from dye precipitation during storage). Selection of the proper cation can also significantly improve resistor life of the printhead. Substitution of FD&C Blue Dye #1 improves resistor life from about 13 million firings to about 25 million firings by changing the cation associated with the dye from sodium to triethanol amine.

Chemical Abstracts volume 105, no. 4, 1986, pages 96 to 97, abstract No. 25977y (Kobayashi *et al.*) discloses dye solutions useful for ink-jet printing which have been treated by (a) treating the dye with cation exchange resin to reduce the sodium content to less than 100ppm, (b) stirring the dye with aqueous NaOH to partially replace the sodium cations removed in step (a), and (c) treating the modified dye with monoethanolamine. The treated dye is reported to have improved storage properties.

FR-A-2549844 (Canon KK) discloses passing dye solutions through an ion-exchange separator, in particular to remove heavy-metal ions. This is found to improve the storage properties of the dye solutions.

EP-A-0210378 (Bayer AG) discloses a process for the preparation of concentrated solutions of anionic dyes. The process comprises an ion exchange whereby sodium cations associated with the dissolved dyes are replaced by lithium or N-substituted ammonium cations. The ion exchange is carried out by a two-step process according to which the dye solution is first treated with an acid ion-exchange resin to generate the free acid form of the dye in solution. The acid form is then neutralised with lithium hydroxide or an N-substituted ammonium hydroxide to produce the ion-exchanged dye solution. This reference was published after the priority date of the present applica-

tion.

EP-A-0216296 (Mitsubishi Kasei Corporation) discloses a very similar two-step ion-exchange process for replacing sodium cations in a solution of an anionic dye by lithium or ammonium cations, thereby improving the solubility of the dye. This reference also was published after the priority date of the present application.

Finally, EP-A-0259088 (Hewlett-Packard Company) discloses improved ink compositions for use in ink-jet printers. The ink compositions comprise a dye having a plurality of anionic sites originally associated with undesirable cations such as sodium, at least a portion of said cations being replaced with tetramethyl-ammonium or lithium cations. The process used to achieve this ion-exchange is a two-step process very similar to those disclosed in EP-A-0210378 and EP-A-0216296. This reference also was published after the priority date of the present application.

In one process developed by the assignee of the present application, such cation substitution is achieved by reverse osmosis (ultrafiltration). The process is quite useful for purification of the dye. However, while producing highly acceptable dyes (in which the extent of cation substitution is controlled), reverse osmosis requires an expenditure of processing time operating at pressures of about 682 kPa to 2069 kPa (100 to 300 psi) that may be unacceptable for some manufacturing processes.

Accordingly, a need remains for a more rapid process for improving the properties of dyes used in ink-jet printing.

DISCLOSURE OF INVENTION

It is an object of the present invention to provide a process for reducing crusting of dyes used in ink-jet printing.

It is another object of the present invention to provide a process for improving the properties of dyes used in ink-jet printing by cation substitution.

It is yet another object of the present invention to provide a process for increasing the efficiency of cation substitution, as measured by a decrease in processing time, on dyes used in ink-jet printing.

It is a further object of the present invention to provide a process for the controllable and facile substitution of cations on dyes used in ink-jet printing.

These and further objects of the invention will become more readily apparent upon a consideration of the following commentary.

Briefly, a process is provided for the fabrication of ink compositions used in ink-jet printing. The process is suitably employed for dyes employed in such inks having at least one negatively charged functional group, such as a sulfonate group, with

which sodium cations are associated.

According to the present invention, the desired cation species is loaded onto a resin in an ion-exchange column, and the sodium cations are replaced directly with the desired cation species.

Ion exchange is a very fast and efficient process for replacement of one cation species by another. Further, certain cations, such as divalent cations, that cannot be substituted onto the dye molecule by other processes, such as reverse osmosis, can be substituted by ion exchange.

Commercially prepared dyes are presently available complexed with sodium cations. Thus, it will be appreciated that the discussion which follows is given in terms of partially or totally replacing sodium cations with certain desirable cations; the resulting modified dye evidences improved properties over the sodium form. However, it should be understood that the process of the invention may be used to replace any cation on a dye molecule with another cation.

In the practice of the process of the invention, it is preferred that the dye first be purified. While not essential to the practice of the invention, the purification step improves the efficiency of the ion exchange process.

Dye purification is best accomplished by reverse osmosis. In this process, chloride, excess sodium, and impurities, which are present in the dye as received from the manufacturer, are removed from the dye.

In the purification of the dye, the dye is first dissolved in water in an amount ranging from about 8 to 15 wt%, or up to the solubility limit of the dye, to form a dye solution. The lower concentration is constrained by economic considerations, with the overall process consuming too long a period of time at concentrations much below about 8 wt%. The upper concentration is constrained by the presence of too much dye clogging the membrane in reverse osmosis purification.

The dye solution is then purified by reverse osmosis, using spiral wound, plate and frame or open tubular type systems or variations thereof. For a spiral wound system, for example, the pressure may range from about 689 kPa to 2069 kPa (100 to 300 psi) and the flow (which is a function of the membrane employed) is typically maintained in the range of about 3.8 to 11.4 l/min (1 to 3 gal/min) per pressure vessel of 9.3 m² to 18.6 m² (100 to 200 ft²) of membrane area.

While the reverse osmosis process is ordinarily operated at room temperature, it may be operated at an elevated temperature, limited only by the composition of the membrane or the boiling point of the solution. In practice, the temperature may range from about 0° to 100°C. It is possible to utilize several pressure vessels in parallel, which

provides a corresponding increase in surface area. Further, series configurations may be employed; such configurations are also well-known.

As is well-known, the feed stock in the pressure vessel is separated by the membrane into a concentrate (which contains the dye) and the permeate (which contains impurities and a small amount of the dye).

The reverse osmosis process is used to remove chloride ions, excess sodium ions and other impurities and to provide a dye that has a purity of about 99.9%. The conductivity of the concentrate is monitored, conveniently using a chloride electrode, until a substantially constant reading is achieved and equilibrium is reached, which indicates that no more purification is taking place. The purified dye still has sodium cations associated with the sulfonate groups on the dye.

According to the present invention there is provided a process for preparing an ink composition comprising a vehicle and a dye having associated therewith at least one negatively charged functional group with which a sodium cation is associated, said ink composition being suitable for use in ink-jet printing, said process comprising: (a) replacing at least a portion of said sodium cation on said dye with a preselected second cation species other than sodium or proton and comprising at least one member selected from the group consisting of alkali metals, alkaline-earth metals, quaternary amines, protonated primary, secondary and tertiary amines and ammonium, employing an ion exchange resin, to form an ion-exchanged dye; and (b) admixing said ion-exchanged dye with said vehicle to form said ink, characterised in that said sodium cation on said dye is replaced directly with said preselected second cation species in a one step ion exchange process by passing an aqueous solution of said dye through an ion exchange resin loaded with said preselected second cation species.

Suitable ion exchange resins are so-called strong acid ion exchange resins, such as Dowex 50X-8, available from Dow Chemical Company (Midland, MI), Duolite Cation Resin 225X 10H, available from Rohm & Haas (Philadelphia, PA), and Amberlite CG 120, also available from Rohm & Haas. Many other strong acid ion exchange resins are also commercially available.

During the ion exchange step, the dye solution is diluted from its initial concentration. The dye solution is next concentrated to return the concentration to a desired level. Reverse osmosis is again advantageously employed to remove excess water, and requires about one-half the time of the purification process. UV/visible spectrophotometry is employed to monitor the concentration.

Finally, the vehicle is added to the dye solution to form the ink. The vehicle may comprise any of, or a mixture of two or more of, the following components: glycols such as ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-butanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 2,5-hexanediol, hexylene glycol, glycerol, half ethers and ethers of propylene glycols such as propylene glycol monomethyl ether, propylene glycol isopropyl ether, propylene glycol *n*-butyl ether, propylene glycol ethyl ether, dipropylene glycol monomethyl ether, dipropylene glycol ethyl ether, dipropylene glycol *n*-butyl ether, dipropylene glycol *iso*-propyl ether, tripropylene glycol monomethyl ether, tripropylene glycol ethyl ether, tripropylene glycol *n*-butyl ether, tripropylene glycol, ethers of glyceryl such as glyceryl α -monomethyl ether, glyceryl α,γ -dimethyl ether, glyceryl α -mono-*n*-butyl ether, alcohols such as *sec*-butyl alcohol, *tert*-amyl alcohol, cyclohexyl alcohol, *sec*-octyl alcohol, diacetone alcohol, benzyl alcohol, *iso*-propanol, *n*-propanol, methanol, ethanol, esters such as butyl lactate, ethyl lactate, *n*-butyl propionate, polymeric glycols such as PEG 200, PEG 300, PEG 400, PPG 400, and water.

Further, the vehicle may include any of the additives used in ink-jet compositions, such as surfactants to improve the wettability of the ink on paper, polymers to help control bubble formation of inks in thermal ink-jet printers, fungicides, and bactericides. The purity of the components used in preparing the inks of the invention is that found in normal commercial practice.

It is well-known that sodium cations associated with a dye such as Food Black 2 cause crusting. The process of the invention provides a dye having a cation species, such as one listed above, which has been found to reduce crusting of the ink.

Yet, sodium-containing dyes often have better kogation properties than many of the cation-substituted dyes. Kogation is a coined term, unique to thermal ink-jet printing, which describes the extent of decomposition of the ink on the resistors of thermal ink-jet printers as a consequence of heating. Such heating is used to form droplets of ink, which are propelled toward the substrate.

Often, a balance between the desirable low crusting properties of the cation-substituted dye and the desirable low kogation properties of the sodium-containing dye may be achieved by blending the cation-exchanged dye with sodium-containing dye, the latter possibly purified by the reverse osmosis process described above to remove excess sodium.

In formulating such a blend, many factors will ordinarily be considered, such as the construction of the ink pen, that is, the resistor design, how hot

the resistors are fired, the character of the surface (the extent of carbon sticking from the decomposition of the ink, or kogation), the thickness of layers for heat transfer, and so forth.

Ion exchange is a very fast and efficient process for replacement of one cation species with another. Further, ion exchange can be used to replace cations on the dye molecules that could not be easily accomplished by other techniques, such as reverse osmosis.

INDUSTRIAL APPLICABILITY

The process of the invention is useful in the preparation of inks used in ink-jet printing, and particularly in thermal ink-jet printing.

Claims

1. A process for preparing an ink composition comprising a vehicle and a dye having associated therewith at least one negatively charged functional group with which a sodium cation is associated, said ink composition being suitable for use in ink-jet printing, said process comprising:
 - (a) replacing at least a portion of said sodium cation on said dye with preselected second cation species other than sodium or proton and comprising at least one member selected from the group consisting of alkali metals, alkaline-earth metals, quaternary amines, protonated primary, secondary and tertiary amines and ammonium, employing an ion exchange resin, to form an ion-exchanged dye; and
 - (b) admixing said ion-exchanged dye with said vehicle to form said ink;
 characterised in that said sodium cation on said dye is replaced directly with said preselected second cation species in a one step ion exchange process by passing an aqueous solution of said dye through the ion exchange resin loaded with said preselected second cation species.
2. A process according to claim 1 wherein said dye containing said sodium cation is purified prior to said cation-replacing.
3. A process according to claim 2 wherein said dye is purified by reverse osmosis.
4. A process according to any preceding claim wherein said preselected second cation species comprises at least one member selected from lithium, potassium, tetramethyl amine, triethanol amine, diethylene amine, and ammo-

Finally, the vehicle is added to the dye solution to form the ink. The vehicle may comprise any of, or a mixture of two or more of, the following components: glycols such as ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-butanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 2,5-hexanediol, hexylene glycol, glycerol, half ethers and ethers of propylene glycols such as propylene glycol monomethyl ether, propylene glycol isopropyl ether, propylene glycol *n*-butyl ether, propylene glycol ethyl ether, dipropylene glycol monomethyl ether, dipropylene glycol ethyl ether, dipropylene glycol *n*-butyl ether, dipropylene glycol *iso*-propyl ether, tripropylene glycol monomethyl ether, tripropylene glycol ethyl ether, tripropylene glycol *n*-butyl ether, tripropylene glycol, ethers of glyceryl such as glyceryl α -monomethyl ether, glyceryl α,γ -dimethyl ether, glyceryl α -mono-*n*-butyl ether, alcohols such as *sec*-butyl alcohol, *tert*-amyl alcohol, cyclohexyl alcohol, *sec*-octyl alcohol, diacetone alcohol, benzyl alcohol, *iso*-propanol, *n*-propanol, methanol, ethanol, esters such as butyl lactate, ethyl lactate, *n*-butyl propionate, polymeric glycols such as PEG 200, PEG 300, PEG 400, PPG 400, and water.

Further, the vehicle may include any of the additives used in ink-jet compositions, such as surfactants to improve the wettability of the ink on paper, polymers to help control bubble formation of inks in thermal ink-jet printers, fungicides, and bactericides. The purity of the components used in preparing the inks of the invention is that found in normal commercial practice.

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In formulating such a blend, many factors will ordinarily be considered, such as the construction of the ink pen, that is, the resistor design, how hot

the resistors are fired, the character of the surface (the extent of carbon sticking from the decomposition of the ink, or kogation), the thickness of layers for heat transfer, and so forth.

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 - (a) replacing at least a portion of said sodium cation on said dye with preselected second cation species other than sodium or proton and comprising at least one member selected from the group consisting of alkali metals, alkaline-earth metals, quaternary amines, protonated primary, secondary and tertiary amines and ammonium, employing an ion exchange resin, to form an ion-exchanged dye; and
 - (b) admixing said ion-exchanged dye with said vehicle to form said ink;
 characterised in that said sodium cation on said dye is replaced directly with said preselected second cation species in a one step ion exchange process by passing an aqueous solution of said dye through the ion exchange resin loaded with said preselected second cation species.
2. A process according to claim 1 wherein said dye containing said sodium cation is purified prior to said cation-replacing.
3. A process according to claim 2 wherein said dye is purified by reverse osmosis.
4. A process according to any preceding claim wherein said preselected second cation species comprises at least one member selected from lithium, potassium, tetramethyl amine, triethanol amine, diethylene amine, and ammo-



nium.

5. A process according to any preceding claim wherein following said ion exchange, said dye solution is concentrated to a desired concentration. 5
6. A process according to claim 5 wherein said dye solution is concentrated using reverse osmosis. 10
7. A process according to any preceding claim wherein said vehicle comprises at least one component selected from glycols, glycerol, half ethers and ethers of propylene glycols, ethers of glyceryl, alcohols, esters, polymeric glycols, and water. 15
8. A process according to claim 7 wherein said at least one component comprises a member selected from ethylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, propylene glycol, dipropylene glycol, tripropylene glycol, 1,3-butanediol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 2,5-hexanediol, hexylene glycol, propylene glycol monomethyl ether, propylene glycol isopropyl ether, propylene glycol *n*-butyl ether, propylene glycol ethyl ether, dipropylene glycol monomethyl ether, dipropylene glycol ethyl ether, dipropylene glycol *n*-butyl ether, dipropylene glycol *iso*-propyl ether, tripropylene glycol monomethyl ether, tripropylene glycol ethyl ether, tripropylene glycol *n*-butyl ether, tripropylene glycol, glyceryl α -monomethyl ether, glyceryl α,γ -dimethyl ether, glyceryl α -mono-*n*-butyl ether, *sec*-butyl alcohol, *tert*-amyl alcohol, cyclohexyl alcohol, *sec*-octyl alcohol, diacetone alcohol, benzyl alcohol, *iso*-propanol, *n*-propanol, methanol, ethanol, butyl lactate, ethyl lactate, *n*-butyl propionate, and polymeric glycols. 20
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9. A process according to claim 8 wherein said vehicle comprises at least one glycol. 45
10. A process according to claim 9 wherein said glycol comprises a member selected from diethylene glycol, triethylene glycol, and polyethylene glycol. 50

Patentansprüche

1. Verfahren zum Herstellen einer Tintenzusammensetzung mit einem Lösungsmittel und einem Farbstoff, dem wenigstens eine negativ geladene, funktionelle Gruppe mit einem zugeordneten Natrium-Kation zugeordnet ist, wobei 55

die Tintenzusammensetzung zur Verwendung beim Tintenstrahldrucken geeignet ist, umfassend:

- (a) Ersetzen wenigstens eines Teils des Natrium-Kations auf dem Farbstoff durch ausgewählte, zweite Kationenarten außer Natrium oder Protonen, die wenigstens ein Element aus der Gruppe umfassen, die aus Alkalimetallen, Alkalierdmetallen, quarternären Aminen, protonierten primären, sekundären und tertiären Aminen und Amonium besteht, wobei ein Ionenaustauschharz verwendet wird, um einen ionenausgetauschten Farbstoff zu bilden; und
 - (b) Zumischen des besagten ionenausgetauschten Farbstoffs zu dem Lösungsmittel, um die Tinte zu bilden;
- dadurch gekennzeichnet, daß das Natriumkation auf dem Farbstoff in einem Einschnitt-ionenaustauschverfahren unmittelbar durch die ausgewählte, zweite Kationenart ausgetauscht wird, indem eine wässrige Lösung des Farbstoffs durch das Ionenaustauschharz geleitet wird, das mit der ausgewählten, zweiten Kationenart beladen ist.
2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß der das Natriumkation enthaltende Farbstoff vor dem Ersetzen des Kations gereinigt wird.
 3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß der Farbstoff durch Umkehrosmose gereinigt wird.
 4. Verfahren nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die ausgewählte, zweite Kationenart wenigstens ein Element der aus Natrium, Kalium, Tetramethylamin, Triethanolamin, Diethylenamin und Ammonium bestehenden Gruppe umfaßt.
 5. Verfahren nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Farbstofflösung nach dem Ionenaustausch auf eine gewünschte Konzentration aufkonzentriert wird.
 6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß die Farbstofflösung durch Umkehrosmose aufkonzentriert wird.
 7. Verfahren nach einem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß das Lösungsmittel wenigstens eine Komponente aus der aus Glykolen, Glycerol, halben Ethern und Ethern von Propylenglykolen, Glycerylethern, Alkoholen, Estern, polymeren Glykolen und



Wasser bestehenden Gruppe enthält.

8. Verfahren nach Anspruch 7, dadurch gekennzeichnet, daß wenigstens eine Komponente ein Element aus der aus Ethylenglykol, Diethylenglykol, Triethylenglykol, Tetraethylenglykol, Propylenglykol, Dipropylenglykol, Tripropylenglykol, 1,3-Butandiol, 1,4-Butandiol, 1,5-Pentandiol, 1,6-Hexandiol, 2,5-Hexandiol, Hexylenglykol, Propylenglykol-Monomethylether, Propylenglykol-Isopropylether, Propylenglykol-n-Butylether, Propylenglykol-Ethylether, Dipropylenglykol-Monomethylether, Dipropylenglykol-Ethylether, Dipropylenglykol-n-Butylether, Dipropylenglykol-Isopropylether, Tripropylenglykol-Monomethylether, Tripropylenglykol-Ethylether, Tripropylenglykol-n-Butylether, Tripropylenglykol, Glyceryl- α -Monomethylether, Glyceryl- α,γ -Dimethylether, Glyceryl- α -Mono-n-Butylether, sec-Butylalkohol, tert-Amylalkohol, Cyclohexylalkohol, sec-Octylalkohol, Diacetonalkohol, Benzylalkohol, Isopropanol, n-Propanol, Methanol, Ethanol, Butyllactat, Ethyllactat, n-Butylpropionat und polymeren Glykolen bestehenden Gruppe enthält.

9. Vorrichtung nach Anspruch 8, dadurch gekennzeichnet, daß das Lösungsmittel wenigstens ein Glykol enthält.

10. Vorrichtung nach Anspruch 9, dadurch gekennzeichnet, daß das Glykol ein Element aus der aus Diethylenglykol, Triethylenglykol und Polyethylenglykol bestehenden Gruppe enthält.

Revendications

1. Procédé pour préparer une composition formant encre comportant un véhicule et un colorant associé à au moins un groupe fonctionnel chargé négativement avec lequel un cation sodium est associé, ladite composition formant encre étant adaptée pour être utilisée dans une impression à jet d'encre, ledit procédé consistant à :

(a) remplacer au moins une partie dudit cation sodium situé sur ledit colorant à l'aide d'une seconde espèce de cation présélectionné autre que le sodium ou d'un proton et comportant au moins un élément choisi parmi le groupe constitué des métaux alcalins, des métaux de terres alcalines, d'amines quaternaires, d'amines primaires, secondaires et tertiaires protonées et d'ammonium, en utilisant une résine échangeuse d'ions, pour former un colorant à ion échangé, et

(b) mélanger ledit colorant à ion échangé avec ledit véhicule pour former ladite encre, caractérisé en ce que ledit cation sodium situé sur ledit colorant est remplacé directement par ladite seconde espèce de cation présélectionné dans un procédé d'échange d'ions à un seul cycle en faisant passer une solution aqueuse dudit colorant à travers la résine échangeuse d'ions chargée à l'aide de ladite seconde espèce de cation présélectionné.

2. Procédé selon la revendication 1, dans lequel ledit colorant contenant ledit cation sodium est purifié avant d'être soumis au remplacement de cation.

3. Procédé selon la revendication 2, dans lequel ledit colorant est purifié par osmose inverse.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel ladite seconde espèce de cation présélectionné comporte au moins un élément choisi parmi le lithium, le potassium, la tétraméthylamine, la triéthanolamine et l'ammonium.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel après ledit échange d'ions, ladite solution formant colorant est concentrée à une concentration voulue.

6. Procédé selon la revendication 5, dans lequel ladite solution formant colorant est concentrée en utilisant l'osmose inverse.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit véhicule comporte au moins un composant choisi parmi les glycols, le glycérol, les demi-éthers et éthers de propylèneglycol, les éthers de glycérol, les alcools, les esters, les glycols polymériques, et l'eau.

8. Procédé selon la revendication 7, dans lequel ledit au moins un composant est constitué d'un élément choisi parmi l'éthylèneglycol, le diéthylèneglycol, le triéthylèneglycol, le tétraéthylèneglycol, le propylèneglycol, le dipropylèneglycol, le tripropylèneglycol, le butanédiol-1,3, le butanédiol-1,4, le pentanédiol-1,5, l'hexanédiol-1,6, l'hexanédiol-2,5, l'hexylèneglycol, l'éther monométhyle du propylèneglycol, l'éther isopropyle du propylèneglycol, l'éther n-butylique du propylèneglycol, l'éther éthylique du propylèneglycol, l'éther monométhyle du dipropylèneglycol, l'éther éthylique du dipropylèneglycol, l'éther n-butylique du dipropylèneglycol, l'éther iso-propylique du



dipropylèneglycol, l'éther monométhylque du tripropylèneglycol, l'éther éthylique du tripropylèneglycol, l'éther n-butylique du tripropylèneglycol, le tripropylèneglycol, l'éther α -monométhylquedu glycérol, l'éther α,γ -diméthylque du glycérol, l'éther α -mono-n-butylique du glycérol, l'alcool butylique secondaire, l'alcool amylique tertiaire, l'alcool cyclohexylique, l'alcool octylique secondaire, le diacétone alcool, l'alcool benzylique, l'iso-propanol, le n-propanol, le méthanol, l'éthanol, le butyle lactate, l'éthyle lactate, le n-butyle propionate, et les glycols polymériques.

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9. Procédé selon la revendication 8, dans lequel ledit véhicule comporte au moins un glycol.

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10. Procédé selon la revendication 9, dans lequel ledit glycol comporte un élément choisi parmi le diéthylèneglycol, le triéthylèneglycol, et le polyéthylèneglycol.

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