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(54) **WATER BASED WAX DISPERSION COMPRISING A HYDROCARBON WAX AND A DIALKYLETHER FOR THE COATING PAPER PRODUCTS**

WASSERBASIERTE WACHSDISPERSION MIT EINEM KOHLENWASSERSTOFFWACHS UND EINEM DIALKYLETHER ZUR BESCHICHTUNG VON PAPIERPRODUKTEN

DISPERSION DE CIRE AQUEUSE COMPRENANT UNE CIRE À BASE D'HYDROCARBURES ET UN ÉTHER DE DIALKYLIQUE, DESTINÉE À L'ENDUCTION DE PRODUITS DE PAPIER

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Description

[0001] The present invention relates to a water based wax dispersion comprising a hydrocarbon wax and a dialkylether for the coating of paper products, the use thereof, the method of coating paper products therewith and the coated printed paper product.

Background

[0002] Paper products are coated or varnished after printing to increase slip and to reduce the abrasion and friction. Such treatment results in an over print varnish which helps to reduce any negative impact that may arise to printed paper surfaces from further handling. The treatment is also used to improve the overall gloss of the paper.

[0003] Over print varnish compositions are especially applied in the manufacture of brochures, advertisement prints or packages produced with offset printing technology. The purpose of the over print varnish is to protect printed surfaces during processing after the print and upgrade its appearance due to the additional level of gloss.

[0004] Over print varnishes used to finish and condition printed papers may be oil- or water-based, and based on UV-crosslinking polymers, lacquers or waxes.

[0005] Since the development of water based inks in the 1970-ies water based over print varnishes have increasingly been applied after the printing process in an offset printing press. Water based over print varnishes are still commonly used until present.

[0006] US 3985932 describes the use of waxes in water based paper coatings. According to the disclosure a paper coating additive can be obtained by using hard waxes, especially Fischer-Tropsch waxes, with a melting point above 80° C and a particle size less than 50 μm. The waxes are suggested as a substitute for calcium stearate which has been commonly used as lubricating agent, and in order to improve the gloss and the brightness of the printed paper.

[0007] Also the installation engineering of offset printing machines developed over the years and was adapted to apply water based inks and over print varnishes. Through the change from two-roll-systems to wipe-off chamber-machines the spreading of the varnish became more homogeneous, the dosage accuracy of the varnish was improved and additional pigments could be applied (e.g. pearlescent or metallic pigments).

[0008] EP 0930161 B1 teaches the use of special anilox rolls to spread 10 to 30 % silicone-, silicone wax- or wax-emulsions as over print varnish on paper, which provide a homogeneous and sufficient coating of the paper, show no mottling and reduce the formation of wax deposits.

[0009] The greatest disadvantages often associated with water based over print varnishes are the low heat-resistance, an inhomogeneous coating due to the oil-repellency of dye residuals on the surface as well as the insufficient adhesion between multiple layers.

[0010] Alternative products such as silicone oil-based emulsions are expensive, do not produce a reliable gloss and have a high deposition tendency which can block the applicator roll in the printing press, thereby making time consuming cleaning operations necessary.

[0011] It is therefore an aim of the present invention to overcome above insufficiencies and provide a water based wax formulation for surface curing of paper- and print-products with improved properties.

[0012] It was surprisingly found that water based wax formulations containing dialkylethers can fulfill these needs.

[0013] In the prior art dialkylethers, especially NACOL®-ether of Sasol (Dihexyl (C6), dioctyl (C8) and didecyl (C10)) are mentioned as a release agent, defoaming agent and an additive for a wide range of other applications (DE 102004056786).

[0014] DE 4237501A1 describes dialkyethers, in particular a dioctylether, as a replacement of mineral oil in metal surface treatment. The oil phase of the prepared 5 % aqueous emulsions contained more than 50 wt.-% dialkylether and other components (for example fatty alcohol ethoxylates). The emulsions are used for anticorrosion coatings for metals and have a good material compatibility with rubber gaskets.

[0015] EP 0635342 A1 discloses release emulsions for separating concrete from a mould using 2 to 3 weight parts of a dialkyether. An exemplary composition consists of 145 parts water, 35 parts palm kernel fatty acid-butylester, 13 parts di-hexylether, 9 parts of lauryl alcohol and 1 part of coconut fatty acid-diethanolamide.

[0016] WO 2010018017 A2 describes the use of long chain (C8 to C50) dialkyether in pulverulent material compositions (mortar, putty, glue joints etc.). The ether in the compositions acts as a dust-binder without adversely affecting other properties such as efficacy, stability and strength.

[0017] DE 19854531 A1 claims defoamer granules for solid detergents which contain in addition to silicones also dialkylethers (C6 to C22) as defoamers and mentions the advantageous dustbinding properties of dialkylethers and the ability to minimize the disadvantages of silicone coatings like stickiness.

[0018] DE 10133399 A1 describes compositions based on wax, which can be used as a basis for cosmetic products, but also for the impregnation and wetting of hygienic cloth paper. In addition to the wax component the formulations contain dialkyether as a constituent of the oil phase and less than 10 wt.-% of water. A preferred embodiment is composed

of:

1-50 wt.-% of at least one dialkylether,
0.1-5 wt.-% of at least one active substance,
1-10 wt.-% of at least one oil,
0.1-10 wt.-% of at least one emulsifier,
5-90 wt.-% of wax components and
0-5 wt.-% water.

[0019] DE 102005005176 A1 from Beiersdorf describes water-in-oil emulsions comprising solid dialkylethers and/or dialkycarbonates for cosmetic applications. Oil- and wax-components are mentioned as further ingredients, but from the group of hydrocarbons only paraffin oils are listed, which are used with a concentration of 5.0 to 17.5 wt.-% in the emulsion. Preferred dialkylethers according to this patent are saturated, linear C12-C22-dialkyethers such as distearylether ($C_{18}H_{37}$-O-$C_{18}H_{37}$). The dialkylethers are used to increase the viscosity of the emulsion.

[0020] None of the cited prior art documents describe or suggest the use of dialkylethers in wax emulsions or dispersions to obtain a uniform paper coating.

[0021] It is therefore an objective of the present invention to provide a wax dispersion that is smoothly applicable to a paper surface such as by modern offset printing machines and when applied to the printed surface of a paper product results in an uniform paper coating that provides good gloss and protection to the surface.

Summary of the invention

[0022] It was found that wax dispersions comprising:

a) a dispersed phase comprising:

- at least one hydrocarbon wax and
- at least one dialkylether; wherein the weight ratio of the hydrocarbon wax to the dialkylether is 2 : 1 to 4 : 1;

b) a continuous phase comprising more than 50 wt.% of water relative to the total weight of the wax dispersion; and
c) at least one surfactant

have advantageous properties in the surface treatment of paper products, in particular printed paper products.

[0023] Paper products according to the invention are materials produced in a process comprising bringing together moist fibers, typically cellulose pulp derived from wood, rags or grasses, and drying them into the final shape. Paper products can be used for writing and/or printing upon. Furthermore they are widely used as packaging material and include card boards and corrugated boards.

[0024] The printed paper product coated with the inventive wax dispersion shows an improved abrasion stability and a higher gloss.

[0025] In a preferred embodiment the wax dispersion comprises 50 to 95 wt.-% water, more preferably 65 to 75 wt.-% water relative to the total weight of the wax dispersion.

Detailed description of the invention

[0026] Hydrocarbon waxes according to the present invention are physically defined as compositions preferably having a congealing point of 40° C or above and typically melt between 50 and 90° C with exceptional cases up to 200° C without decomposition.

[0027] Hydrocarbon waxes according to the invention are waxes that comprise more than 99 % hydrogen and carbon atoms, preferably comprising more than 99.8 % hydrogen and carbon atoms and most preferably consisting solely out of hydrogen and carbon atoms.

[0028] The hydrocarbon wax may be present in a concentration of 5 to 30 wt.-%, preferably 15 to 20 wt.-% relative to the total weight of the wax dispersion and may be a petroleum based paraffin wax, synthetic Fischer-Tropsch wax or polyolefin wax or mixtures thereof, independent thereof preferably with a congealing point according to DIN ISO 2207 of 40 to 110° C, more preferably 40 to 90° C and most preferably 50 to 70° C.

[0029] The relatively low hydrocarbon wax content of the wax dispersion improves the dilutability thereof with water.

[0030] The dispersion may comprise non-ionic or cationic surfactants or both.

[0031] The non-ionic surfactant may be present in a concentration of 2 to 10 wt.-%, preferably 6 to 8 wt.-% relative to the total weight of the wax dispersion and is preferably an alcohol ethoxylate or propoxylate or both, more preferably an

oxo-alcohol ethoxylate. Independent thereof preferably the alcohol group contains 8 to 24 carbon atoms, more preferably 10 to 18 carbon atoms and the degree of ethoxylation is 2 to 20, more preferably 4 to 12.

[0032] The non-ionic surfactant improves the spreadibility of the wax dispersion on the roll and the paper afterwards and decreases the particle size of the emulsion. The low particle size improves a homogeneous, thin coating and allows a further dilution with water before the paper application.

[0033] The cationic surfactant may be present in a concentration of 1 to 3 wt.-%, preferably 1.5 to 2 wt.-% relative to the total weight of the wax dispersion and is preferably a protonated N-alkyl-diamine or a quaternary ammonium compound having at least one alkyl group, and more preferably a protonated N-alkyl-propylen-diamin, wherein the alkyl group contains 6 to 24 carbon atoms, preferably 10 to 18.

[0034] The cationic surfactant increases the affinity of the wax dispersion to the mostly negative surface charge of the paper fibres, thereby showing good wetting and spreading properties. Further such wax dispersions impose an antistatic effect to the paper surface.

[0035] The dialkylethers may be present in a concentration of 1 to 10 wt.-%, preferably 4 to 6 wt.-% relative to the total weight of the wax dispersion and have the following formula R^1-O-R^2, wherein R^1 and R^2 are independently of each other aliphatic, cycloaliphatic or aromatic hydrocarbon residues, preferably linear or branched aliphatic hydrocarbon residues each with 6 to 32 carbon atoms, preferably 6 to 12 carbon atoms.

[0036] Preferably R^1 is equal to R^2 and is selected from the group of hexyl-, octyl- or decyl-residues, more preferably R^1 and R^2 are octyl-residues.

[0037] Without the wish to be bound to this theory it is assumed that the ether migrates to the surface of the water phase and improves the spreadability as well as the affinity of the dispersion on and to the roll and the paper. It acts as a release agent for the wax on the rolls resulting in a homogeneous and stable coating with a high gloss, which can even be increased by polishing the surface. The ether also leads to a distinctly lower wax deposit formation on the rolls by the reduction of printing ink removal.

[0038] Conventional silicone or wax emulsions and dispersions do not produce a homogeneous and constant coating of the paper. Next to that they are not polishable and tend to deposit on and block the rolls by carrying inks pigments with them.

[0039] The weight ratio of the hydrocarbon wax to the dialkylether ranges from 2 : 1 to 4 : 1, preferably from 2.8 : 1 to 3.4 : 1.

[0040] According to a further embodiment the wax dispersion is characterised by an average particle size d_{90} (number average) of the particles and droplets below 300 μm, determined by laser diffraction and/or light scattering. The small particles result in a higher specific surface area and improve the performance and spreading of the wax dispersion in the coating process.

[0041] The wax dispersion is preferably further characterised by a surface tension of 30 to 40 $mN \cdot m^{-1}$, more preferably 35 to 36 $mN \cdot m^{-1}$. The surface tension is determined with the plate method according to Wilhelmy. The surface tension is important to provide a good distribution of the dispersion on the rolls and the paper.

[0042] When a cationic surfactant is applied the wax dispersion has a pH-value of 6 to 9, preferably 7.5 to 8.5, which may be adjusted by adding organic or mineral acids and/or amines, preferably acetic acid and/or dicyclohexylamine.

[0043] According to a further embodiment of the invention the wax dispersion is a concentrate and the ready-to-use wax dispersion is obtainable from the concentrate by diluting with water in a ratio of 1 (wax dispersion) : 1 (water) to 1 : 5.

[0044] According to a further aspect of the invention there is provided a method of coating paper product comprising applying a wax dispersion mentioned above to a surface of a paper product, preferably webs of paper. The wax dispersion may be diluted with water in a ratio of 1 : 1 to 1 : 5 prior to coating or alternatively diluting the dispersion until a concentration of the sum of the hydrocarbon wax and the dialkylether of 3.5 to 12 wt.-%, preferably 8 to 11 wt.-% relative to the total weight of the wax dispersion is obtained.

[0045] Preferably the paper product surface is a printed paper product surface. The method may optionally comprise a drying or polishing step or both after the coating.

[0046] The amount of the sum of the hydrocarbon wax and the dialkylether applied to the paper product may be from 0.2 to 1 $g \cdot m^{-2}$, preferably from 0.4 to 0.9 $g \cdot m^{-2}$.

[0047] The invention further related to the use of the wax dispersion as described herein for obtaining a coating on a printed paper product, wherein the printed paper product obtained has an improved abrasion stability or an improved gloss or both.

[0048] The invention is further described by the examples without being limited thereto.

Examples

[0049] A wax dispersion A according to the present invention consisting of

68.12 wt.-% water

16.19 wt.-% hydrocarbon wax (Sasolwax M5 from Sasol Wax GmbH)
8.00 wt.-% non-ionic surfactant (Lutensol TO 8 from BASF)
5.00 wt.-% dialkylether (NACOL-8-Ether from Sasol Germany GmbH)
1.70 wt.-% cationic surfactant (Dinoram 42E from Ceca)
0.74 wt.-% 60% acetic acid (from BCD Chemie GmbH)
0.25 wt.-% dicyclohexylamine (from Overlack)

was produced and had the following properties

pH-value:	8.1
Surface tension:	36 $mN \cdot m^{-1}$

[0050] The surface tension was measured with a Kruess Tensiometer K100 with the plate method according to Wilhelmy.

[0051] The wax used for above wax dispersion is a Fischer-Tropsch wax with a congealing point of 58° C measured according to DIN ISO 2207.

[0052] The non-ionic surfactant is a C13-Oxo alcohol ethoxylate with a degree of ethoxylation of 8.

[0053] The dialkylether is a di-n-octylether and the cationic surfactant is an N-alkyl-propylen-diamine.

[0054] Wax dispersions with non-ionic surfactants typically show heavy foam formation. After bubbling air through 100 ml of the dispersion for 120 seconds in a 1000 ml beaker glass at least 900 ml of foam will form. The wax dispersion according to the invention does not show foam formation in the same test, which results in an improved application in the paper coating process.

[0055] The average particle size of the above wax dispersion was d_{10} = 0.072 μm, d_{50} = 0.125 μm and d_{90} = 0.210 μm, from which a calculated specific surface area of 52 $m^2 \cdot ml^{-1}$, based on the wax concentration and the assumption that the particles are spherical, results. This is much lower than conventional silicone or wax emulsions with d_{50} = 0.400 μm, from which a specific surface area of only 20 $m^2 \cdot ml^{-1}$ can be calculated.

[0056] The average particle size was measured by laser diffraction and light scattering with an instrument from Beckman Coulter (LS13320) using 5 drops of the dispersion diluted in 30 ml distilled water.

[0057] The above wax dispersion was used as over print varnish in an offset printing procedure using LWC130 or SC-paper (80 $g \cdot m^{-2}$) with a high ink-load. The wax dispersion was further diluted 1 : 2 with water before being applied to the printed paper via the steel turning bar. According to gravimetric reweighing of the coated paper the amount of wax dispersion applied to was 0.4 to 0.9 $g \cdot m^{-2}$.

[0058] The abrasion- and grit-stability of the printed paper coated with the above wax dispersion A was determined with a "Quartant Scheuertester" from Prufbau. A printed paper sample and a sample of a printed paper coated with the wax dispersion A were scrubbed with a defined number of hubs at norm pressure against an unprinted paper. The number of hubs needed to transfer any colour to the unprinted sample or to destroy the printing of the sample is a degree for the abrasion stability. This was always higher for printed paper coated with the above wax dispersions compared to an uncoated paper.

[0059] Another quick possibility to test the abrasion stability is to determine the abrasion with the palm of hand or the thumb. In the lab scale the abrasion stability of the coated paper was tested by rubbing oscillatory and with pressure over a 30 cm ruler and checking how long it needs to destroy the print.

	High-gloss (20°)	**Middle-gloss (60°)**	**Dull-gloss (85°)**
Uncoated silk paper	1.6	12.2	44.8
Paper coated with inventive wax dispersion A (unpolished)	6.8	45.3	87.7
Paper coated with inventive wax dispersion A (polished)	11.9	53.0	90.7
Paper coated with standard wax dispersion *HydroWax 170* from Sasol Wax GmbH (unpolished)	1.2	11.0	42.8
Paper coated with standard wax dispersion *HydroWax 170* from Sasol Wax GmbH (polished)	6.9	24.2	48.1
Paper coated with silicone emulsion *Rollosil CXT 9* from Fujifilm Europe NV (not polishable)	1.6	12.3	59.9

[0060] The gloss of the printed and coated paper was determined with a Micro-TRI-gloss analyzer from BYK-Gardner at angles of 20°, 60° and 85° (high-, middle-, dull-gloss) according to DIN 67530. Due to the polishability of the inventive wax coating a much higher high- and middle-gloss can be obtained compared to an unpolished coating or a silicone coating.

[0061] *HydroWax 170* is a wax dispersion without dialkylether consisting of 64 wt.-% water, 2.0 wt.-% polyvinyl alcohol (hydrolized with 0. 5 wt-% KOH) and 0.5 wt.-% anionic naphthalene sulfonate surfactant and 33 wt.-% of a wax phase (28 wt.-% hydrocarbon wax with a congealing point of 63 to 65° C, 3.3 wt.-% Carnauba wax and 1.7 wt.-% aliphatic hydrocarbon resin Escorez 1102 F from Exxon Mobile).

[0062] The wax dispersion according to the invention is compatible with other dispersions and emulsions of non-ionic and/or cationic type, which are usually used as over print varnish, and can be used interchangeably with them. That means no cleaning is needed before or after using the wax dispersion according to the invention if another dispersion or emulsion has been used or is to be used respectively. That also allows mixing of the inventive wax dispersion with silicone emulsions if applicable or needed.

Claims

1. A wax dispersion comprising

a) a dispersed phase comprising:

- at least one hydrocarbon wax and
- at least one dialkylether; wherein the weight ratio of the hydrocarbon wax to the dialkylether is 2 : 1 to 4 : 1;

b) a continuous phase comprising more than 50 wt.% of water relative to the total weight of the wax dispersion; and
c) at least one surfactant.

2. The wax dispersion according to claim 1, further **characterized by** one or more of the following features:

- in that the wax dispersion comprises 5 to 30 wt.-% of the hydrocarbon wax, preferably 15 to 20 wt.-% of the hydrocarbon wax;
- in that the wax dispersion comprises 1 to 10 wt.-% of the dialkylether, preferably 4 to 6 wt.-% of the dialkylether;
- in that the wax dispersion comprises 50 to 95 wt.-% water, preferably 65 to 75 wt.-% water;
- in that the wax dispersion comprises 2 to 10 wt.-% of the surfactant, preferably 6 to 8 wt.-% of the surfactant;

all weight ratios are relative to the total weight of the wax dispersion.

3. The wax dispersion according to claim 1 or 2, wherein independent of each other

a) the weight ratio of the hydrocarbon wax to the dialkylether is 2.8 : 1 to 3.4 : 1;
b) the hydrocarbon wax and the dialkylether together comprise 10 to 50 wt.-%, preferably 15 to 30 wt.-% of the total weight of the wax dispersion.

4. The wax dispersion according to any of the preceding claims, wherein the hydrocarbon wax is selected from one or more members of the group consisting of petroleum based paraffin wax, synthetic Fischer-Tropsch wax, polyolefin wax and combinations thereof.

5. The wax dispersion according to any of the preceding claims, wherein the hydrocarbon wax has a congealing point according to DIN ISO 2207 of 40 to 110° C, preferably 40 to 90° C and more preferably 50 to 70° C.

6. The wax dispersion according to any of the preceding claims, wherein the dialkylether has the following formula R^1-O-R^2 and wherein R^1 and R^2 are independently of each other aliphatic, cycloaliphatic or aromatic hydrocarbon residues, preferably linear or branched aliphatic hydrocarbon residues, with 6 to 32 carbon atoms, preferably 6 to 12 carbon atoms, and independent thereof preferably R^1 is equal to R^2 and is selected from the group of hexyl-, octyl- or decyl-residues, more preferably R^1 and R^2 are octyl-residues.

7. The wax dispersion according to any of the preceding claims, wherein the dispersed phase comprises solid particles at 23° C and preferably each of the individual particles comprises a mixture of the at least one dialkylether and the

at least one hydrocarbon wax.

8. The wax dispersion according to any of the preceding claims, wherein the surfactant is at least one non-ionic surfactant or at least one cationic surfactant or both.

9. The wax dispersion according to claim 8, wherein the non-ionic surfactant is an alcohol ethoxylate or propoxylate or both, preferably an oxo-alcohol ethoxylate.

10. The wax dispersion according to claim 8 comprising 1 to 3 wt.-% of the cationic surfactant, preferably 1.5 to 2 wt.-% of the cationic surfactant.

11. The wax dispersion according to any of claims 8 or 10, wherein the cationic surfactant is at least one protonated N-alkyl-diamine or quaternary ammonium compound, preferably a protonated N-alkyl-propylen-diamine.

12. The wax dispersion according to any of the preceding claims having a pH-value of 6 to 9, preferably a pH of 7.8 to 8.5, measured at 25°C, wherein the pH-value is preferably adjusted by adding organic or mineral acids and/or amines, preferably acetic acid and/or dicyclohexylamine.

13. The wax dispersion according to any of the preceding claims, wherein the wax dispersion has a surface tension of 30 to 40 $mN \cdot m^{-1}$, preferably 35 to 36 $mN \cdot m^{-1}$.

14. The wax dispersion according to any of the preceding claims, wherein the particles have an average particle size d_{90} (number average) of below 300 μm.

15. A diluted wax dispersion, wherein the wax dispersion according to any of the preceding claims is diluted with water in a weight ratio of 1 : 1 to 1 : 5.

16. A method of coating paper comprising applying a wax dispersion comprising

a) a dispersed phase comprising:

- at least one hydrocarbon wax and
- at least one dialkylether;

b) a continuous phase comprising more than 50 wt.% of water relative to the total weight of the wax dispersion; and
c) at least one surfactant;

to a surface of a paper product, preferably webs of paper, wherein the surface of the paper product is a printed paper product surface, optionally further comprising after the step of applying the wax dispersion a drying or polishing step or both.

17. The method according to claim 16 comprising applying the wax dispersion as claimed in any of the claims 1 to 15.

18. A method of coating paper products comprising applying the wax dispersion as claimed in claims 1 to 14 to a surface of a paper product, preferably webs of paper, wherein the wax dispersion is diluted with water in a weight ratio of 1 : 1 to 1 : 5 prior to coating the surface or alternatively diluting the dispersion until a concentration of the sum of the hydrocarbon wax and the dialkylether of 3.5 to 12 wt.-%, preferably 8 to 11 wt.-% is obtained and wherein the surface of the paper product is a printed paper product surface, optionally further comprising after the step of applying the wax dispersion a drying or polishing step or both.

19. The method according to claims 16, 17 or 18, wherein the hydrocarbon wax and the dialkylether are applied to the paper product with a coating weight of 0.2 to 1 $g \cdot m^{-2}$, preferably 0.4 to 0.9 $g \cdot m^{-2}$, relative to the coated surface of the paper product.

20. A printed paper product having a coating,

a) the coating being obtainable by the method according to claims 16 to 19; or
b) the coating comprising the at least one hydrocarbon wax and the at least one dialkylether, wherein the weight

ratio of the hydrocarbon wax to the dialkylether being 2 : 1 to 4 : 1, preferably 2.8 : 1 to 3.4 : 1 and more preferably the amount of the sum of the hydrocarbon wax and the dialkylether applied to the paper product is 0.2 to 1 $g \cdot m^{-2}$, preferably 0.4 to 0.9 $g \cdot m^{-2}$, relative to the surface of the printed paper product.

21. A use of the coating obtained by applying the wax dispersion according to any of claims 1 to 15 to a paper surface for improving abrasion stability or improving gloss or both of a coated paper product, preferably a coated printed paper product.

22. A use of the wax dispersion according to claims 1 to 15 for coating surfaces, wherein the surface preferably is a surface of a paper product.

Patentansprüche

1. Wachsdispersion, umfassend

a) eine dispergierte Phase, umfassend:

- mindestens ein Kohlenwasserstoffwachs und
- mindestens einen Dialkylether; wobei das Gewichtsverhältnis des Kohlenwasserstoffwachses zu dem Dialkylether 2:1 bis 4:1 beträgt;

b) eine kontinuierliche Phase, die mehr als 50 Gew.-% Wasser bezogen auf das Gesamtgewicht der Wachsdispersion umfasst; und
c) mindestens ein Tensid.

2. Wachsdispersion nach Anspruch 1, die ferner durch ein oder mehrere der folgenden Merkmale gekennzeichnet ist:

- dass die Wachsdispersion 5 bis 30 Gew.-% des Kohlenwasserstoffwachses, vorzugsweise 15 bis 20 Gew.-% des Kohlenwasserstoffwachses umfasst;
- dass die Wachsdispersion 1 bis 10 Gew.-% des Dialkylethers, vorzugsweise 4 bis 6 Gew.-% des Dialkylethers umfasst;
- dass die Wachsdispersion 50 bis 95 Gew.-% Wasser, vorzugsweise 65 bis 75 Gew.-% Wasser umfasst;
- dass die Wachsdispersion 2 bis 10 Gew.-% des Tensids, vorzugsweise 6 bis 8 Gew.-% des Tensids umfasst;

alle Gewichtsverhältnisse beziehen sich auf das Gesamtgewicht der Wachsdispersion.

3. Wachsdispersion nach Anspruch 1 oder 2, wobei unabhängig voneinander

a) das Gewichtsverhältnis des Kohlenwasserstoffwachses zu dem Dialkylether 2,8:1 bis 3,4:1 beträgt;
b) das Kohlenwasserstoffwachs und der Dialkylether gemeinsam 10 bis 50 Gew.-%, vorzugsweise 15 bis 30 Gew.-% des Gesamtgewichts der Wachsdispersion ausmachen.

4. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei das Kohlenwasserstoffwachs aus einem oder mehreren Mitgliedern der Gruppe ausgewählt ist, die aus Paraffinwachs auf Erdölbasis, synthetischem Fischer-Tropsch-Wachs, Polyolefinwachs und Kombinationen daraus besteht.

5. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei das Kohlenwasserstoffwachs einen Erstarrungspunkt nach DIN ISO 2207 von 40 bis 110° C, vorzugsweise 40 bis 90° C und bevorzugter 50 bis 70° C aufweist.

6. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei der Dialkylether die folgende Formel R^1-O-R^2 aufweist und wobei R^1 und R^2 unabhängig voneinander aliphatische, cycloaliphatische oder aromatische Kohlenwasserstoffreste, vorzugsweise lineare oder verzweigte aliphatische Kohlenwasserstoffreste, mit 6 bis 32 Kohlenstoffatomen, vorzugsweise 6 bis 12 Kohlenstoffatomen, sind, und unabhängig davon vorzugsweise R^1 gleich R^2 ist und aus der Gruppe der Hexyl-, Octyl- oder Decylreste ausgewählt ist, bevorzugter R^1 und R^2 Octylreste sind.

7. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei die dispergierte Phase feste Teilchen bei 23° C umfasst und vorzugsweise jedes der einzelnen Teilchen eine Mischung aus dem mindestens einen Dialkylether

und dem mindestens einen Kohlenwasserstoffwachs umfasst.

8. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei das Tensid zumindest ein nichtionisches Tensid oder zumindest ein kationisches Tensid oder beides ist.

9. Wachsdispersion nach Anspruch 8, wobei das nichtionische Tensid ein Alkoholethoxylat oder -propoxylat oder beides ist, vorzugsweise ein Oxoalkoholethoxylat.

10. Wachsdispersion nach Anspruch 8, die 1 bis 3 Gew.-% des kationischen Tensids, vorzugsweise 1,5 bis 2 Gew.-% des kationischen Tensids umfasst.

11. Wachsdispersion nach einem der Ansprüche 8 oder 10, wobei das kationische Tensid zumindest eine protonierte N-Alkyl-Diamin- oder quaternäre Ammoniumverbindung, vorzugsweise ein protoniertes N-Alkyl-propylendiamin ist.

12. Wachsdispersion nach einem der vorhergehenden Ansprüche mit einem pH-Wert von 6 bis 9, vorzugsweise einem pH-Wert von 7,8 bis 8,5, gemessen bei 25°C, wobei der pH-Wert vorzugsweise durch Zugeben von organischen oder anorganischen Säuren und/oder Aminen, vorzugsweise Essigsäure und/oder Dicyclohexylamin, eingestellt ist.

13. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei die Wachsdispersion eine Oberflächenspannung von 30 bis 40 $mN \cdot m^{-1}$, vorzugsweise 35 bis 36 $mN \cdot m^{-1}$ aufweist.

14. Wachsdispersion nach einem der vorhergehenden Ansprüche, wobei die Teilchen einen mittleren Teilchendurchmesser d_{90} (Zahlenmittel) von unter 300 μm aufweisen.

15. Verdünnte Wachsdispersion, wobei die Wachsdispersion nach einem der vorhergehenden Ansprüche mit Wasser in einem Gewichtsverhältnis von 1:1 bis 1:5 verdünnt ist.

16. Verfahren zum Beschichten von Papier, das ein Aufbringen einer Wachsdispersion, die Folgendes umfasst:

a) eine dispergierte Phase, umfassend:

- mindestens ein Kohlenwasserstoffwachs und
- mindestens einen Dialkylether;

b) eine kontinuierliche Phase, die mehr als 50 Gew.-% Wasser bezogen auf das Gesamtgewicht der Wachsdispersion umfasst; und
c) mindestens ein Tensid;

auf eine Oberfläche eines Papierprodukts, vorzugsweise Papierbahnen, umfasst, wobei die Oberfläche des Papierprodukts eine bedruckte Papierproduktoberfläche ist, gegebenenfalls ferner umfassend, nach dem Schritt des Aufbringens der Wachsdispersion, einen Trocknungs- oder Glättungsschritt oder beides.

17. Verfahren nach Anspruch 16, das ein Auftragen der Wachsdispersion nach einem der Ansprüche 1 bis 15 umfasst.

18. Verfahren zum Beschichten von Papierprodukten, das ein Aufbringen der Wachsdispersion nach Anspruch 1 bis 14 auf eine Oberfläche eines Papierprodukts, vorzugsweise Papierbahnen, umfasst, wobei die Wachsdispersion vor dem Beschichten der Oberfläche mit Wasser in einem Gewichtsverhältnis von 1:1 bis 1:5 verdünnt wird, oder alternativ ein Verdünnen der Dispersion, bis eine Konzentration der Summe aus dem Kohlenwasserstoffwachs und dem Dialkylether von 3,5 bis 12 Gew.-%, vorzugsweise 8 bis 11 Gew.-% erhalten wird, und wobei die Oberfläche des Papierprodukts eine bedruckte Papierproduktoberfläche ist, gegebenenfalls ferner umfassend, nach dem Schritt des Aufbringens der Wachsdispersion, einen Trocknungs- oder Glättungsschritt oder beides.

19. Verfahren nach Anspruch 16, 17 oder 18, wobei das Kohlenwasserstoffwachs und der Dialkylether auf das Papierprodukt mit einem Beschichtungsgewicht von 0,2 bis 1 $g \cdot m^{-2}$, vorzugsweise 0,4 bis 0,9 $g \cdot m^{-2}$, bezogen auf die beschichtete Oberfläche des Papierprodukts aufgebracht werden.

20. Bedrucktes Papierprodukt, das eine Beschichtung aufweist,

a) wobei sich die Beschichtung mit dem Verfahren nach Anspruch 16 bis 19 erhalten lässt; oder
b) die Beschichtung das mindestens eine Kohlenwasserstoffwachs und den mindestens einen Dialkylether umfasst, wobei das Gewichtsverhältnis des Kohlenwasserstoffwachses zu dem Dialkylether 2:1 bis 4:1, vorzugsweise 2,8:1 bis 3,4:1 beträgt und bevorzugter die Menge der Summe aus dem Kohlenwasserstoffwachs und dem Dialkylether, die auf das Papierprodukt aufgebracht sind, 0,2 bis 1 $g \cdot m^{-2}$, vorzugsweise 0,4 bis 0,9 $g \cdot m^{-2}$, bezogen auf die Oberfläche des bedruckten Papierprodukts beträgt.

21. Verwendung der Beschichtung, die durch Aufbringen der Wachsdispersion nach einem der Ansprüche 1 bis 15 auf eine Papieroberfläche erhalten wird, zur Verbesserung der Abriebbeständigkeit oder zur Verbesserung des Glanzes oder von beidem bei einem beschichteten Papierprodukt, vorzugsweise einem beschichteten bedruckten Papierprodukt.

22. Verwendung der Wachsdispersion nach Anspruch 1 bis 15 zum Beschichten von Oberflächen, wobei die Oberfläche vorzugsweise eine Oberfläche eines Papierprodukts ist.

Revendications

1. Dispersion de cire, comprenant :

a) une phase dispersée comprenant :

- au moins une cire hydrocarbonée et
- au moins un éther dialkylique, où le rapport en poids de la cire hydrocarbonée sur l'éther dialkylique est de 2 : 1 à 4 : 1 ;

b) une phase continue comprenant plus de 50 % en poids d'eau par rapport au poids total de la dispersion de cire ; et
c) au moins un tensioactif.

2. Dispersion de cire selon la revendication 1, **caractérisée en outre par** une ou plusieurs des caractéristiques suivantes :

- en ce que la dispersion de cire comprend 5 à 30 % en poids de cire hydrocarbonée, de préférence 15 à 20 % en poids de cire hydrocarbonée ;
- en ce que la dispersion de cire comprend 1 à 10 % en poids d'éther dialkylique, de préférence 4 à 6 % en poids d'éther dialkylique ;
- en ce que la dispersion de cire comprend 50 à 95 % en poids d'eau, de préférence 65 à 75 % en poids d'eau ;
- en ce que la dispersion de cire comprend 2 à 10 % en poids de tensioactif, de préférence 6 à 8 % en poids de tensioactif ;

tous les rapports en poids étant relatifs au poids total de la dispersion de cire.

3. Dispersion de cire selon la revendication 1 ou 2, dans laquelle indépendamment l'un de l'autre

a) le rapport en poids de la cire hydrocarbonée sur l'éther dialkylique est de 2,8 : 1 à 3,4: 1 ;
b) la cire hydrocarbonée et l'éther dialkylique comprennent conjointement 10 à 50 % en poids, de préférence 15 à 30 % en poids du poids total de la dispersion de cire.

4. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle la cire hydrocarbonée est choisie parmi un ou plusieurs éléments du groupe se composant de la cire de paraffine à base de pétrole, la cire synthétique de Fischer-Tropsch, la cire de polyoléfine et des combinaisons de celles-ci.

5. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle la cire hydrocarbonée a un point de gélification selon la norme DIN ISO 2207 de 40 à 110°C, de préférence de 40 à 90°C et plus préférentiellement de 50 à 70°C.

6. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle l'éther dialkylique a la

formule suivante R^1-O-R^2 et dans laquelle R^1 et R^2 sont indépendamment l'un de l'autre des résidus hydrocarbonés aliphatiques, cyclo-aliphatiques ou aromatiques, de préférence des résidus hydrocarbonés aliphatiques linéaires ou ramifiés, ayant de 6 à 32 atomes de carbone, de préférence de 6 à 12 atomes de carbone, et indépendamment de cela, R^1 est de préférence égal à R^2 et est choisi dans le groupe des résidus hexyliques, octyliques ou décyliques, R^1 et R^2 sont plus préférentiellement des résidus octyliques.

7. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle la phase dispersée comprend des particules solides à 23°C et chacune des particules individuelles comprend de préférence un mélange du au moins un éther dialkylique et de la au moins une cire hydrocarbonée.

8. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle le tensioactif est au moins un tensioactif non ionique ou au moins un tensioactif cationique ou les deux.

9. Dispersion de cire selon la revendication 8, dans laquelle le tensioactif non ionique est un éthoxylate ou propoxylate d'alcool ou les deux, de préférence un éthoxylate d'oxoalcool.

10. Dispersion de cire selon la revendication 8 comprenant 1 à 3 % en poids de tensioactif cationique, de préférence 1,5 à 2 % en poids de tensioactif cationique.

11. Dispersion de cire selon l'une quelconque des revendications 8 ou 10, dans laquelle le tensioactif cationique est au moins une N-alkyldiamine protonée ou un composé d'ammonium quaternaire, de préférence une N-alkylpropylènediamine protonée.

12. Dispersion de cire selon l'une quelconque des revendications précédentes ayant un pH de 6 à 9, de préférence un pH de 7,8 à 8,5, mesuré à 25°C, où le pH est de préférence ajusté en ajoutant des acides organiques ou minéraux et/ou des aminés, de préférence de l'acide acétique et/ou de la dicyclohexylamine.

13. Dispersion de cire selon l'une quelconque des revendications précédentes, la dispersion de cire ayant une tension superficielle de 30 à 40 $mN \cdot m^{-1}$, de préférence 35 à 36 $mN \cdot m^{-1}$.

14. Dispersion de cire selon l'une quelconque des revendications précédentes, dans laquelle les particules ont une taille moyenne de particules d_{90} (moyenne en nombre) inférieure à 300 μm.

15. Dispersion de cire diluée, la dispersion de cire selon l'une quelconque des revendications précédentes étant diluée avec de l'eau en un rapport en poids de 1 : 1 à 1 : 5.

16. Procédé d'enduction de papier comprenant l'application d'une dispersion de cire comprenant

a) une phase dispersée comprenant :

- au moins une cire hydrocarbonée et
- au moins un éther dialkylique ;

b) une phase continue comprenant plus de 50 % en poids d'eau par rapport au poids total de la dispersion de cire ; et
c) au moins un tensioactif ;

sur une surface d'un produit de papier, de préférence des voiles de papier, où la surface du produit de papier est une surface de produit de papier imprimée, comprenant en outre éventuellement après l'étape d'application de la dispersion de cire une étape de séchage ou de polissage ou les deux.

17. Procédé selon la revendication 16 appliquant la dispersion de cire revendiquée selon l'une quelconque des revendications 1 à 15.

18. Procédé d'enduction de produits de papier comprenant l'application de la dispersion de cire revendiquée selon les revendications 1 à 14 sur une surface d'un produit de papier, de préférence des voiles de papier, dans lequel la dispersion de cire est diluée avec de l'eau en un rapport en poids de 1 : 1 à 1 : 5 avant l'enduction de la surface ou, en variante, la dilution de la dispersion jusqu'à ce qu'une concentration de la somme de la cire hydrocarbonée et

de l'éther dialkylique de 3,5 à 12 % en poids, de préférence 8 à 11 % en poids soit obtenue et dans lequel la surface du produit de papier est une surface de produit de papier imprimé, comprenant en outre éventuellement après l'étape d'application de la dispersion de cire une étape de séchage ou de polissage ou les deux.

19. Procédé selon les revendications 16, 17 ou 18, dans lequel la cire hydrocarbonée et l'éther dialkylique sont appliqués au produit de papier à un poids d'enduction de 0,2 à 1 $g \cdot m^{-2}$, de préférence 0,4 à 0,9 $g \cdot m^{-2}$, par rapport à la surface enduite du produit de papier.

20. Produit de papier imprimé ayant un revêtement

a) le revêtement pouvant être obtenu par le procédé selon les revendications 16 à 19 ; ou
b) le revêtement comprenant la au moins une cire hydrocarbonée et le au moins un éther dialkylique, où le rapport en poids de la cire hydrocarbonée sur l'éther dialkylique est de 2 : 1 à 4 : 1, de préférence 2,8 : 1 à 3;4 : 1 et, plus préférentiellement, la quantité de la somme de la cire hydrocarbonée et dé l'éther dialkylique appliquée sur le produit de papier est de 0,2 à 1 $g \cdot m^{-2}$, de préférence 0,4 à 0,9 $g \cdot m^{-2}$, par rapport à la surface du produit de papier imprimé.

21. Utilisation du revêtement obtenu en appliquant la dispersion de cire selon l'une quelconque des revendications 1 à 15 sur une surface de papier pour améliorer la stabilité à l'abrasion ou améliorer la brillance, ou les deux, d'un produit de papier enduit, de préférence d'un produit de papier imprimé enduit.

22. Utilisation de la dispersion de cire selon les revendications 1 à 15 pour l'enduction de surfaces, dans laquelle la surface est de préférence une surface d'un produit de papier.

REFERENCES CITED IN THE DESCRIPTION

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