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(54) **PAPER FOR INK JET PRINTING**

PAPIER FÜR TINTENSTRAHLDRUCK

PAPIER POUR IMPRESSION À JET D'ENCRE

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(73) Proprietor: **SAPPI Netherlands Services B.V.**
6211 AA Maastricht (NL)

(72) Inventors:
- **BOTTY, Gilbert**
  NL-6226 DG Maastricht (NL)
- **BALLET, Wim**
  B-3620 Lanaken (BE)

(74) Representative: **Bremi, Tobias Hans**
Isler & Pedrazzini AG
Gotthardstrasse 53
Postfach 1772
8027 Zürich (CH)

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Description

TECHNICAL FIELD

[0001] The present document relates to the field of inkjet papers and methods for making them, and it in particularly relates to inkjet papers with quick drying properties and high-gloss.

BACKGROUND OF THE INVENTION

[0002] As outlined in WO 01/45956, ink-jet printers will produce an image on most papers, but the print quality varies heavily in dependence on the nature of the paper used. By "print quality" is meant factors such as the sharpness, intensity and uniformity of the image produced and its susceptibility to smudging immediately or shortly after the ink has been applied. In the case of colour printing, it is important also that the colours should not run into one another and that they should be vivid, with good brightness.

[0003] In order to achieve the highest quality colour images, with vivid bright colours which do not run into one another, it is necessary to e.g. apply a pigment coating to the paper. The pigment coating makes the paper highly absorptive to the aqueous ink vehicle, so that the vehicle drains away quickly into the body of the paper, leaving the coloured dye at the surface and thereby giving bright intense colours with minimal print bleed.

[0004] A wide variety of pigments has been proposed for such coatings, and WO 01/45956 states the use of gel-type silicas to be necessary to give the desired print quality. However, such silicas are expensive, and because of their rheological characteristics, they can only be used at relatively low solids content. This creates either a heavy drying load or a reduced machine speed at limited drying capacity.

[0005] The most widely used general-purpose paper coating pigments are kaolin and calcium carbonate, particularly precipitated calcium carbonate (PCC). They have been used or proposed for use in coated ink jet papers, but primarily as extenders or in low-cost papers not designed to produce the highest quality colour images.

[0006] In view of the above problems, WO 01/45956 proposes to use a speciality cationic PCC product according to WO-A-96/29369A which is much cheaper than silica pigments, and is easier to use from a rheological standpoint in combination with a minor proportion of gel-type silica included in the formulation, and all this for an image receiving top coating layer. Remaining disadvantage is the relatively low solids content of the coating formulation.

[0007] US 598 5424 discloses a method comprising coating a base coat on a support, said base coat comprising precipitated calcium carbonate and calcinated clay at a solids content of 60%. WO2006/003391 discloses an inkjet receiver comprising a support; an upper layer comprising a binder and a first inorganic particulate material having a mean particulate diameter of 500 nm or less, as well as an under layer comprising a binder and an inorganics particulate material. EP1114735 discloses an inkjet paper comprising a support and (i) a base coating comprising 75 parts of precipitated calcium carbonate and 25 parts of precipitated silica and a binder and (ii) an ink-receptive top coating comprising fumed alumina.

SUMMARY OF THE INVENTION

[0008] The object of the present invention is therefore to provide an improved inkjet paper eliminating at least one of the disadvantages mentioned above and/or providing an economically and technically viable alternative to the solutions according to the state-of-the-art.

[0009] The present invention solves the above problem by providing a method for making an ink jet paper as detailed further below as well as an inkjet paper comprising two layers, an image receiving coating layer for gloss and a pre-coat layer for printing ink vehicle absorption beneath this image receiving coating layer, wherein these two coating layers both have specific coating formulations and both having a clear positive effect upon the printing properties. It is to be noted that the specific choice as given below provides a solution to the difficult problem to provide a coating which on the one hand can be of high-gloss and quick ink-drying, can be printed with most commercial inkjet printers/colours leading to vivid colours without bleeding and similar effects, and additionally a coating that can be run on a normal coating machine such as a blade coater without problems. So the specific proposed choice of a specifically designed image receiving coating layer with a further specifically designed pre-coating layer has to be regarded not as a simple superposition of these two layers but as a synergetic system in as far as adherence and ink receiving properties concerned etc.

[0010] One of the key features of the invention is therefore the fact that the proposed inkjet paper comprises at least one image receiving coating layer and at least one pre-coat layer beneath said image receiving coating layer on a paper substrate, wherein the pre-coat layer comprises a specific formulation as follows:

100 parts in dry weight of a pigment part consisting of

20-75 parts in dry weight of at least one type of fine particulate calcium carbonate and/or kaolin;

5 - 70 parts in dry weight of at least one type of fine particulate silica and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide; and

0 - 30 parts of additional fine particulate pigments

4 - 20 parts in dry weight of a binder part

0-6 parts in dry weight of additives.

[0011] At the same time the image receiving coating layer also comprises a specific formulation as follows:

100 parts in dry weight of a pigment part consisting of

50 - 100 parts in dry weight of at least one type of fine particulate silica; and

0 - 50 parts in dry weight of at least one type of fine particulate polymer, e.g. plastic or biopolymer pigment; and

0 - 30 parts of additional fine particulate pigments

2 - 10 parts in dry weight of a binder

0-3 parts in dry weight of additives.

[0012] The total coating recipe of the pre-coat layer and/or of the image receiving coating layer is chosen to be in an overall anionic state. This is in contrast to conventional inkjet coating formulations, in which normally in at least one of the coating layers, normally in the ink receptive coating layer, specifically a cationic total coating system is provided to fix the anionic inkjet dyes. One such conventional inkjet coating formulation based on a purely cationic topcoat layer is for example described in EP 1114735, where for an ink receptive top coating fumed alumina particles with a cationic surface charge are used in order to fix the anionic inkjet dyes, this effect is even supplemented by adding a cationic fixative in a high amount. The cationic nature of the pigment of the ink receptive top coating layer is important according to this document EP 1114735 as if this pigment is partially replaced for example by colloidal silica, the colloidal silica has to be a cationic and therefore very specific type of colloidal silica.

[0013] It is one of the surprising findings according to the present invention that it is possible to use coating layers of anionic overall nature for an inkjet paper and still to be able to fix the conventional inkjet dyes and to have the possibility of a glossy surface appearance. The fixing of the conventional inkjet dyes in these anionic coating layers can be supported by the presence of cationic systems like mordants which however are added to the coating in an amount small enough such that the overall coating is still anionic.

[0014] The additional fine particulate pigments can be selected from (preferably anionic) pigments such as carbonate, in particular calcium carbonate such as precipitated or ground calcium carbonate, clay, silica, in particular silica gel or colloidal silica, kaolin, talc, as well as combinations and mixtures thereof.

[0015] One of the important constituents of the image receiving coating layer and/or of the pre-coat layer is the fine particulate silica. In the pre-coat layer this can either be replaced or supplemented by a specific porous carbonate pigment, more specifically by a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide. Specifically it was found that using the proposed fine particulate ground calcium carbonate with (nano-sized) surface and internal (pore) structure modification, as e.g. disclosed in US 6,666,953 but without necessarily an involved treatment with gaseous carbon dioxide, and as for example available from Omya, CH under the trade name Hydrocarb V70, preferably of the type Hydrocarb V70 R240 ME, on the one hand provides for printing ink vehicle absorption and fast to very fast ink setting properties even if not being the sole constituent of the pigment part. It was specifically found that it is possible to reach overall very fast ink setting properties similar to the ones which can be achieved if fine particulate silica is present in the pigment part, so the proposed specific pigment can be used to at least partially replace if not fully supplement or replace fine particulate silica in the coating while however maintaining similar if not equivalent overall very fast ink setting properties. This is a major achievement as a silica gel is not only difficult to handle in the coating process (e.g. problem of low solids of silica aqueous pigment slurries and prepared coatings and problem of dust formation) and leads to a number of side-effects of the prepared coatings which have to

be corrected for e.g. by additional constituents of the coating formulation, but in addition to that the replacement provides a very attractive cost advantage as silica gel pigments usually are relatively expensive.

[0016] It should be noted that if the specific type of fine particulate ground calcium carbonate with surface and internal structure modification is used, in the pre-coat formulation the: content of may go down to a minimum of one part in dry weight even, the other pigments complementing to 100 parts in dry weight.

[0017] A preferred embodiment of this aspect of the invention is characterised in that the fine particulate ground calcium carbonate with surface and internal structure modification and optionally an additional treatment with gaseous carbon dioxide has a median particle size in the range of approximately 1.5-2.5 μm. It is also advantageous if the fine particulate ground calcium carbonate with surface and internal structure modification and optionally an additional treatment with gaseous carbon dioxide has an average internal pore size in the range of 0.01-0.1 μm, preferably in the range of 0.03-0.08 μm, most preferably around 0.05 μm. Indeed this specific range of around 0.05 μm, to provide high driving force for fast absorption rate and supplemented by a parallel system of interconnected intra-particulate pores or voids in the total pigment matrix with average pores or voids diameter of approximately 0.1 - 1 μm for effective overall ink vehicles transport seems to be well matched to typical offset printing inks leading to very advantageous printing properties. Specifically, a pore system including the above Hydrocarb V70 and a corresponding matrix, optionally provided by a PCC pigment as detailed below, appears to be well matched, and 50 nm driving force pores seem to be similarly powerful as in case of silicagel with typical size range of 10-30 nm pores. Without being bound to any theory, it seems that the parallel traffic system of relatively larges pores in case of pigments of the type of Hydrocarb V70 plus (or combined with) a matrix, optionally based on such PCC, is even somewhat more effective.

[0018] Further the fine particulate ground calcium carbonate with surface and internal structure modification and optionally an additional treatment with gaseous carbon dioxide preferably has a surface area in the range of 30-80 m^2/g, preferably in the range of 50-70 m^2/g. Furthermore the fine particulate ground calcium carbonate with surface and internal structure modification and optionally an additional treatment with gaseous carbon dioxide can advantageously have a particle size distribution such that 73-83% of the particles is smaller than 2 μm, and that 35-44% of the particles is smaller than 1 μm.

[0019] A very good porosity ideal for fast ink setting properties of the final high gloss paper can be achieved if the fine particulate ground calcium carbonate with surface and internal structure modification and optionally an additional treatment with gaseous carbon dioxide is preferably of the so-called roses type. This means that the individual particles of this pigment with a clustered nano-sized platelet structure and with internal nano-sized pores are of generally round and almost spherical shape, and they look similar to if not identical to the ones as disclosed in annex 4 of US 2006/0162884. Also other Hydrocarb V70 forms are possible, e.g. the so-called eggs, golf balls, brains and Beluga/Kaviar types as disclosed e.g. in the publications

Achieving Rapid Absorption and Extensive Liquid Uptake Capacity in Porous Structures by Decoupling Capillarity and Permeability: Nanoporous Modified Calcium Carbonate, in Transport in Porous Media vol. 63, nr. 2, pp. 239-259, May 2006*; or*

Achieving Rapid Absorption and Extensive Liquid Uptake Capacity in Porous Structures by Decoupling Capillarity and Permeability: Nanoporous Modified Calcium Carbonate, in Colloids and Surfaces A: Physicochemical and Engineering Aspects, Vol. 236, Issues 1-3, pp. 91-102, April 1, 2004.

[0020] According to a first preferred embodiment of the invention, the pre-coat layer uses one or several standard fine particulate calcium carbonates, preferably a precipitated (PCC) or ground (GCC) calcium carbonate type. Preferred is a standard anionic PCC type with a surface area in the range of 2-40 m^2/g. The carbonates can be intrinsically porous types, for example the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification.

[0021] According to a further preferred embodiment, the pre-coat layer comprises 100 parts in dry weight of a pigment part consisting of 40-75 parts in dry weight, preferably 50-60 parts in dry weight, of a fine particulate ground or precipitated calcium carbonate; 25-70 parts in dry weight, preferably 40-60 parts in dry weight of at least one fine particulate silica pigment and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide.

[0022] For cost reasons but also for managing bleeding problems which might exist if the silica part in the pre-coat consists of colloidal silica only, it can be advantageous to combine within the silica part of colloidal silica and a silica gel. A certain minimum amount of silica gel is necessary for achieving this reduced bleeding behaviour, however for rheological reasons the silica gel contents should not be too high. Correspondingly therefore it is advantageous if the fine particulate silica pigment in the pre-coat layer is composed of 5-50, preferably 10-50 parts in dry weight of a colloidal silica and 10-40 parts in dry weight of a silica gel. Even more beneficial effects can be achieved if the fine particulate silica pigment

in the pre-coat layer is composed of 10-30, preferably 15-30, parts in dry weight of a colloidal silica and of 20-35, preferably 25-35 parts in dry weight of a silica gel. The silica gel in the pre-coat layer can have a particle size distribution such that the average particle size is in the range of 0.1-10 μm, preferably below 7 μm and most preferably below 4.0 μm. Preferably the pore volume of the silica gel is above 1.0 cm^3/g, more preferably more than 1.5cm^3/g. The colloidal silica in the pre-coat layer can have a particle size distribution such that the average particle size is in the range of 10 - 120 nm, preferentially 40 - 100nm.

[0023] A further preferred embodiment of the present invention is characterised in that the binder part in the pre-coat layer comprises a latex binder and a second binder selected from the group of polyvinyl pyrrolidone binder, PVA, gelatine and mixtures thereof. Specifically it is advantageous if the binder part comprises 2-20, preferably 2-14 (or even 2 - 6) parts in dry weight of a latex binder, preferably a styrene butadiene-binder and 2-8, preferably 4-8 parts in dry weight of a polyvinyl pyrrolidone binder, preferably of polyvinyl pyrrolidone with a molecular weight of more than 20'000 Da, even more preferably of more than 30'000 Da, most preferably in the range of 40'000 Da - 80'000 Da.

[0024] A still further preferred embodiment of the present invention is characterised in that the pre-coat layer comprises 100 parts in dry weight of a pigment part consisting of 50-75 parts in dry weight, preferably 40-60 parts in dry weight, of a particulate ground or precipitated calcium carbonate, wherein the particulate calcium carbonate has a particle size distribution such that 60% of the particles are smaller than 2 μm, preferably such that 50 % of the particles are smaller than 1 μm, even more preferably smaller than 0.7 μm; further it preferably comprises 25-50 parts in dry weight, preferably 40-60 parts in dry weight of a fine particulate silica pigment, e.g. consisting of the two silica types as mentioned above.

[0025] In as far as the image receiving coating layer is concerned, according to a further embodiment of the present invention this layer comprises

100 parts in dry weight of a pigment part consisting of

60 - 100, preferably 60 - 90 parts in dry weight of a fine particulate colloidal silica pigment; and

0 - 40, preferably 10 - 40 parts in dry weight of a fine particulate polymer pigment;

3 - 6 parts in dry weight of a binder;

0 - 2 parts in dry weight of additives.

[0026] According to a further embodiment of this image receiving coating layer the particulate, preferably solid or vacuolated polymer pigment in the image receiving coating layer has a particle size distribution such that more than 90 % of the particles are smaller than 0.5um, preferably with a particle size distribution such that 90 % of the particles have sizes between 0.05 and 0.3 μm, in particular between 0.1 and 0.2 μm, or in the case of a vacuolated polymer pigment also with a mean particle size range of about 0.6 - 1 μm. Indeed it is found that the polymer pigment (biopolymer and/or plastic pigment) can have a stabilising effect on the rheology of the coating formulation and it can reduce the shock effect when a cationic additive, e.g. a cationic, preferably polymeric mordant, is added to the coating formulation.

[0027] A further embodiment of the present invention is characterised in that the binder part in the image receiving coating layer consists of a PVA-binder, a PVP-binder, a gelatine binder or mixtures thereof.

[0028] Preferably the image receiving coating layer comprises a mordant for the dyes. In order not to disturb the anionic (silica) surroundings in this coating the (cationic, preferably polymeric) mordant content should be as low as possible while still allowing fixation of the dye. This can be achieved if the mordant is present in 0.1 - 1.5, preferably 0.5-1.5 parts in dry weight thereof.

[0029] As mentioned above, normally the image receiving coating is directly adjacent to the pre-coat layer.

[0030] Typically the pre-coat layer has a coating thickness in the range of 5-30 g/m^2 preferably in the range of 10-20 g/m^2, and/or the topcoat layer has a coating thickness in the range of 2-20 g/m^2, preferably of 5-10 g/m^2.

[0031] It is preferred among other reasons for allowing production of the coating layer is without problems to have a pre-coat formulation essentially free of cationic (e.g. mordant) components. It is furthermore preferred if the image receiving coating is transparent.

[0032] As usual, the present coatings can be supplemented with additives, and the additives in the pre-coat and/or the image receiving coating can be selected from the group of defoamers, colorants, brighteners, dispersants, thickeners, water retention agents, preservatives, crosslinkers, lubricants and pH control agents, mordants and mixtures thereof.

[0033] As mentioned above, the image receiving coating layer (but preferably not at the pre-coat) may comprise a cationic mordant for the dye as an additive. Beneficially, this in an amount of 0.1-1.5 parts per dry weight, preferably 0.5-1 parts per dry weight.

[0034] As mentioned above it is one beneficial element of the proposed coating formulations that colloidal silica pigment in the image receiving coating layer and/or in the pre-coat can be an unmodified anionic colloidal silica.

[0035] As also mentioned above, the fine particulate calcium carbonate pigment in the pre-coat can be a precipitated calcium carbonate pigment, preferably a needle-shaped type and/or an anionic type. It may also be of the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification.

[0036] The end paper can have a gloss above or equal to 45% according 75°DIN, preferably above or equal to 50%, even more preferably above or equal to 55%, so very high-gloss levels can be achieved especially after calendering.

[0037] Furthermore, as stated above, the present invention relates to a method for producing an inkjet paper as given above. Preferentially, this method is characterised in that in a first step the pre-coat formulation is applied to the paper substrate with a solids content above 40%, preferably in the range of 50-60%, most preferably in the range of 50-55%, and wherein subsequently in a second step the image receiving coating layer formulation is applied with a solids content above or equal to 40%, preferably between 40 and 55%, most preferably between 40 and 50%. Indeed it is one of the unexpected but highly beneficial advantages of the proposed coating formulation that in contrast to the coating formulations according to the state-of-the-art for such types of inkjet papers, the coating formulations can be applied with a relatively high solids content allowing high production speed and low drying efforts. Preferentially, the formulations are applied using blade coating, rod coating, air knife coating, curtain coating, preferably blade coating with a speed of more than 600 m/min, preferably with a speed of more than 800 m/min, even more preferably with a speed of at least 900 m/min.

[0038] For a glossy paper, after application of the two coating layers the paper can be calendered.

[0039] Further embodiments of the present invention are outlined in the dependent claims.

[0040] To summarize, the following main aspects of the invention emerge:

The concept of the new ink jet paper is containing at least two coating layers: one pre-coating layer which is the absorptive layer and one top coating layer which is providing gloss and both layers synergistically enhancing printing properties.

[0041] The obtained coated paper will dry quickly after printing on common ink jet printers and have a high gloss level (up to or even above 55% according DIN75). The coating will be porous contrary to a large part of glossy inkjet papers.

[0042] In the pre-coating layer a typical recipe is as given in Table 1:

Table 1, Precoat layer

	Parts
PCC (e.g. Opacarb A60)	50
Colloidal silica (e.g. Ludox PW50)	20
Silica gel (e.g. Syloid 803)	30
Non-latex-binder, preferably PVP-binder (e.g. PVP or Luvitec K30)	6
Latex binder (e.g. Eurolatex L0607)	4
Additives, e.g. optical brightener	0.5

[0043] The Opacarb pigment is a fine PCC is available from SMI (Specialty Minerals Inc., USA). It can be replaced with GCC, other PCC types.

[0044] The Ludox PW50 is a colloidal silica available from Grace Davison, USA. In this recipe any colloidal silica can be used.

[0045] Syloid C803 is a porous silica gel pigment available from Grace Davison, USA. It can be replaced by other anionic porous pigments such as other silica gel types, the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification, alumino silicates, PCC, calcined clay. This pigment provides the main porosity of the coating layer. It can be used from 10 to 50 parts in the coating.

[0046] PVP or Luvitec K30 is a polyvinyl pyrolidone binder e.g. available from ISP or BASF (DE). In this recipe it is a binder and dye mordant. It can be replaced by other binder types such as polyvinyl alcohol or other PVP grades and copolymers, gelatines.

[0047] Eurolatex L0607 is a SB latex of supplier EOC. It can be replaced with other latexes (SB or acrylate type).

[0048] The solids content of the pre coating recipe is maximized. Solids levels are typically between 50 and 55%, preferably between 50 and 60%.

[0049] Note that preferably there is no cationic aid used in the pre-coating layer as opposed to other inkjet receiving layers. The coating layer hereby stays essentially completely anionic.

[0050] Colour density in the coating layer is obtained by using a combination of colloidal silica and PVP with the PCC.

[0051] The coating composition can be applied by any number of well known techniques such as blade coating, rod

coating, air knife coating, curtain coating. Specific for this coating is that due to the high solids content it can be coated at high speeds typically 900m/min or higher e.g. with the blade coater.

[0052] The coating thickness can be from 5 till 30 gsm per side but is preferably from 10-20 gsm.

[0053] For a top coating recipe a typical recipe is as given in Table 2:

Table 2: Image receiving coating layer

	Parts
Colloidal silica (e.g. Ludox PW50)	80
Plastic pigment (e.g. DPP 3710)	20
Binder (e.g. Mowiol 4-88)	4
Dye mordant (e.g. Induquat ECR 35 L or Cartafix VXU)	1

[0054] The top coating layer is highly porous to obtain a fast flow of the inkjet fluids to the absorptive pre-coating.

[0055] The Ludox PW50 is colloidal silica. In this recipe any anionic colloidal silica can be used.

[0056] DPP 3710 is a plastic pigment particle available from Dow Chemicals. It provides high gloss levels and can be replaced with other plastic pigment types.

[0057] Mowiol 4-88 is a PVOH based binder available from Kuraray. It can be replaced with other hydrophilic binders such as PVP, gelatine. It can be used from 0 to 20 parts.

[0058] Optionally Induquat ECR35L available from Indulor Chemie or Cartafix VXU from Clariant is used as a cationic mordant (poly-DADMAC). It can be used from 0.1 to 1.5 parts. It can be replaced/supplemented with other mordant types.

[0059] The amount of mordant in the coating recipe can be kept low to keep the total coating recipe in an overall anionic state.

[0060] The solids content of the top coating recipe is maximized. Solids levels are typically between 40 and 50%, preferably between 40 and 55%.

[0061] The top coating composition can be applied by any number of well known techniques such as blade coating, rod coating, air knife coating, curtain coating. Specific for this coating is that due to the high solids content it can be coated at high speeds typically 900m/min or higher, preferably with a blade coater.

[0062] The coating yield for the top coating can be from 2 till 20 gsm per side but is preferably from 5-10 gsm.

SHORT DESCRIPTION OF THE FIGURES

[0063] In the accompanying drawings preferred embodiments of the invention are shown in which:

Figure 1 shows the colour density of end paper on three different printer types; and

Figure 2 shows the colour gamut of end paper on three different printer types.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0064] A new coating development has lead to a coating recipe that shows good inkjet printability, quick ink drying and high gloss. This coating can be applied with blade at high speeds and is overall anionic of nature. The development is consisting of a special pre-coating layer in combination with a highly porous top coating layer. After calendering the coating can be printed on a variety of commercial ink-jet printers with different settings to become photo quality prints with lifelike colours. High gloss levels can be obtained while maintaining enough porosity for the inkjet printability of the medium. Colour gamut and optical density are on the accepted high level of commercial papers.

[0065] In the inkjet industry it is common knowledge that the best way to have high optical densities is to use a mordant for the dyes. These mordants are cationic polymers which are also used for water fastness of the prints. It is easy to use this kind of polymers when all the other pigments in the coating bear the same charge, thus are being cationic (e.g. as detailed in WO 01/45956). In regular pigmented inkjet papers this is not an issue since alumina is a cationic pigment by nature and silicas are available in cationic grades as well.

[0066] In our concept however we are using standard PCC's or the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification and unmodified colloidal and other silica particles. These are all anionic by charge and therefore the mixing process with cationic polymers is very difficult. When only as little as 1 part of cationic polymer is added to a PCC slurry a heavy agglomeration caused by a shock effect is very often observed. This shock effect is due to the zero charge of the mixture at that moment. Overdosing of cationic polymers leads to a

cationic coating which is not an option since this might cause shock effects with regular produced anionic coatings commonly run for offset purposes when changing the coating formulations on the machine.

[0067] Therefore the proposal here is to add low amounts of cationic polymers to the coating, resulting in a unique overall anionic ink jet coating concept. Upon wetting with the inkjet fluids these polymers will still be able to bind the anionic dyes and provide further improved colours of the prints.

[0068] The results from laboratory trials led to a preferred formulation with just one pre-coating and one top coating recipe as given in Table 3.

Table 3: coating formulation, P=Pre-coat, T=Topcoating

	P5	T5
Pigments		
Opacarb A 60	50,00	
Ludox PW 50	20,00	80,00
Syloid C 803	30,00	
DPP 3710		20,00
PVP K 30	6,00	
Mowiol 4-88	4,00	4,00
Litex 7110	4,00	
Induquat ECR 35 L		1,00
Final solids of coating (%)	55	48

[0069] The pre-coat layer was applied at 17 gsm and the top coating layer at 8 gsm. In this way coating machine speed of up to 900 m/min were possible. The paper was calendered to a gloss level of 55% or 55.6% according 75°DIN.

[0070] The optical density and the colour gamut of such papers is given in Figure 1 and 2, respectively, for three different ink jet printer types (a: Epson R200, b: Canon 4200, c: HP 5150), respectively. As comparative example commercial paper HP Everyday was used.

[0071] This paper does show the right optical density levels and has vivid colours. It shows no bleed at Epson, HP and the Canon.

[0072] Overall the colours are vivid and bright, optical density levels are high, especially in CMY the optical density of this paper is higher than the HP Everyday paper. As it shows from the graphs the colour gamut in total is larger compared to the colour gamut of the HP Everyday paper.

[0073] The paper could produce photo quality prints on various pre-installed settings for photo paper on various printers, also photo printing software packages delivered with the printer can be used for good quality prints.

[0074] The paper was also tested on a commercial large format printer The prints produced were clear and sharp.

[0075] So the current invention preferably contains two coating layers: a pre-coating and a top coating as follows:

Pre-coating:

[0076] Main pre-coat components: colloidal silica and PVP are supposed to actually fix the dyes;
Colloidal silica such as Ludox PW50 equal/above 10 pph; inter-particle porosity provides (additional) absorptivity ; can be fully or partially replaced by the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification;
Carbonate such as PCC Opacarb A60 can be replaced by e.g. GCC like Covercarb 75; possible range of these carbonates 20-75, preferred 40-60 pph;
Silica gel such as Syloid C803 gives additional porosity; can be fully or partially be replaced by the above-mentioned fine particulate ground calcium carbonate type with surface and internal structure modification;
Binder such as Litex 7110 and/or Eurolatex L0607 essentially needed for improved adhesion of coating layers to substrate;
PVP role as dye mordant (and binder) and its seemingly limited cationogenity related to mesomeric/resonance mechanism;
Solids content of new pre-coat 50-55% versus about 10-30% for regular ink jet coating;
The pre-coating is thus preferentially consisting out of:

Opacarb A60: Fine PCC needle-shaped: provides porosity;

Ludox PW50: fine colloidal silica: provides absorptivity and improved colour density of the prints;

Syloid C 803: porous silica: provides improved liquid absorption and buffer volume;

PVP K 30: binder against colour fading, improved colour density;

Litex 7110: SB-latex: provides improved fixation of the coating layer;

Top coating:

[0077] Top coating layer is preferably transparent.
[0078] The top coating is thus preferably consisting out of:

Ludox PW50: fine colloidal silica: gloss and porosity, transparent;

DPP3710: fine solid sphere plastic pigment: reduce shock effects, provides (additional) gloss;

Mowiol 4-88: binder: protective colloid for cationic mordant;

Induquat ECR35L: mordant: improved colour density, dye fixative;

Common issues for both coating:

[0079] Solids content of new pre-coat (practically) 50-55% and topcoat 48-50%, normally 50% max. versus about only 10-30% for regular ink jet coating; allows high coating application speeds up to 900 - 1100 m/min.
[0080] Quick dry behaviour of new ink jet paper: faster than regular 'swellable type' ink jet papers and about equally fast as porous (cationic and expensive alumina based) ink jet papers in market. No actual drying speed data according specific test available. Based on perception/observations: the printed paper can be touched immediately after removing it from the print tray.
[0081] Other apparent advantages of new concept: a) extra feature = can on paper be regularly coated and printed at two sides (uncommon in case of regular ink jet papers).

Claims

1. Method for producing an inkjet paper comprising at least one image receiving coating layer and at least one pre-coat layer beneath said image receiving coating layer on a paper substrate, wherein
the pre-coat layer comprises

100 parts in dry weight of a pigment part consisting of 20-75 parts in dry weight of a fine particulate calcium carbonate and/or kaolin;

10 - 70 parts in dry weight of a fine particulate silica and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide; and
0 - 30 parts of additional fine particulate pigments

4 - 20 parts in dry weight of a binder part
0-6 parts in dry weight of additives;

and the image receiving coating layer comprises

100 parts in dry weight of a pigment part consisting of 50 - 100 parts in dry weight of a fine particulate silica; and
0 - 50 parts in dry weight of a fine particulate polymer pigment; and

0 - 30 parts of additional fine particulate pigments

2-10 parts in dry weight of a binder
0-3 parts in dry weight of additives.,

wherein in a first step the pre-coat formulation is applied to the paper substrate with a solids content above 40% and wherein subsequently in a second step the image receiving coating layer formulation is applied with a solids content above or equal to 40%.

2. Method according to claim 1, wherein the pre-coat formulation is applied to the paper substrate with a solids content in the range of 50-60%, preferably in the range of 50-55%, wherein preferably the formulation is applied using blade coating, rod coating, air knife coating, curtain coating.

3. Method according to any of the preceding claims, wherein the image receiving coating layer formulation is applied with a solids content between 40-55%, preferably between 40 and 50%, wherein preferably the formulation is applied using blade coating, rod coating, air knife coating, curtain coating, and wherein preferably after application of the two coating layers the paper is calendered.

4. Method according to any of the preceding claims, wherein at least one of the formulations is applied using blade coating with a speed of more than 600 m/min, preferably with a speed of more than 800 m/min, even more preferably with a speed of at least 900 m/min.

5. Method according to any of the preceding claims, wherein the pre-coat and/or the receiving coating formulations are in an overall anionic state.

6. Ink jet paper, made using a method according to any of the preceding claims, comprising at least one image receiving coating layer and at least one pre-coat layer beneath said image receiving coating layer on a paper substrate, wherein the pre-coat layer comprises

100 parts in dry weight of a pigment part consisting of

20-75 parts in dry weight of a fine particulate calcium carbonate and/or kaolin;
10 - 70 parts in dry weight of a fine particulate silica and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide and
0 - 30 parts of additional fine particulate pigments

4 - 20 parts in dry weight of a binder part
0-6 parts in dry weight of additives;

and the image receiving coating layer comprises

100 parts in dry weight of a pigment part consisting of

50 - 100 parts in dry weight of a fine particulate silica; and
0 - 50 parts in dry weight of a fine particulate polymer, such as plastic and/or biopolymer, pigment; and
0 - 30 parts of additional fine particulate pigments

2 - 10 parts in dry weight of a binder
0-3 parts in dry weight of additives.

7. Ink jet paper according to claim 6, wherein the pre-coat layer comprises 100 parts in dry weight of a pigment part consisting of

40-75 parts in dry weight, preferably 50-60 parts in dry weight, of a fine particulate ground or precipitated calcium carbonate;
25-70 parts in dry weight, preferably 40-60 parts in dry weight of a fine particulate silica pigment and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide

wherein preferably the fine particulate silica pigment in the pre-coat layer is composed of 5 - 50, preferably 10-50 parts in dry weight of a colloidal silica and 10-40 parts in dry weight of a silica gel,
and wherein more preferably the fine particulate silica pigment in the pre-coat layer is composed of 10 - 30, preferably 15-30 parts in dry weight of a colloidal silica and of 20 - 35, preferably 25-35 parts in dry weight of a silica gel and wherein even more preferably the silica gel in the pre-coat layer has a particle size distribution such that the average particle size is in the range of 0.1-10 μm, preferably below 7 μm and most preferably below 4.0 μm and/or the colloidal silica in the pre-coat layer has a particle size distribution such that the average particle size is in the range of 10 - 120 nm, preferably 40 - 100 nm.

8. Inkjet paper according to any of the claims 6 - 7, wherein the binder part in the pre-coat layer comprises a latex binder and a second binder selected from the group of polyvinyl pyrrolidone binder, PVA, gelatine and mixtures thereof, wherein more preferably the binder part comprises 2-20, preferably 2-14 parts in dry weight of a latex binder, preferably a styrene butadiene-binder and 2-8, preferably 4-8 parts in dry weight of a polyvinyl pyrrolidone binder, preferably of polyvinyl pyrrolidone with a molecular weight of more than 20'000 Da, even more preferably of more than 30'000 Da, most preferably in the range of 40'000 Da - 80'000 Da.

9. Inkjet paper according to any of the claims 6-8, wherein the pre-coat layer comprises 100 parts in dry weight of a pigment part consisting of 50-75 parts in dry weight, preferably 40-60 parts in dry weight, of a fine particulate ground or precipitated calcium carbonate, wherein the fine particulate calcium carbonate has a particle size distribution such that 50 % of the particles are smaller than 1 μm, preferably smaller than 0.7 μm;

25-50 parts in dry weight, preferably 40-60 parts in dry weight of a fine particulate silica pigment and/or of a fine particulate ground calcium carbonate with surface and internal structure modification as a result of treatment with one or more medium to strong H_3O^+ ion providers and optionally with additional treatment of gaseous carbon dioxide.

10. Inkjet paper according to any of the claims 6-9, wherein the image receiving coating layer comprises

100 parts in dry weight of a pigment part consisting of

60 - 100, preferably 60 - 90 parts in dry weight of a fine particulate colloidal silica pigment; and
0 - 40, preferably 10 - 40 parts in dry weight, preferably 10-30 parts in dry weight, of a fine particulate polymer pigment;

3 - 6 parts in dry weight of a binder
0-2 parts in dry weight of additives.

11. Inkjet paper according to claim 10, wherein the particulate, preferably solid or vacuolated polymer pigment in the image receiving coating layer has a particle size distribution such that more than 90 % of the particles are smaller than 0.5um, preferably with a particle size distribution such that 90 % of the particles have sizes between 0.05 and 0.3 μm, in particular between 0.1 and 0.2 μm, or in the case of a vacuolated polymer pigment also with a mean particle size of about 0.6-1 μm.

12. Inkjet paper according to any of the claims 6 - 11, wherein the binder part in the image receiving coating layer consists of a PVA-binder, a PVP-binder, a gelatine binder or mixtures thereof
and/or wherein the image receiving coating layer comprises a mordant for the dyes, preferably 0.1-1.5, preferably 0.5-1.5 parts in dry weight thereof
and/or wherein the image receiving coating is directly adjacent to the pre-coat layer
and/or wherein the pre-coat layer has a coating thickness in the range of 5-30 g/m^2, preferably in the range of 10-20 g/m^2, and wherein the topcoat layer has a coating thickness in the range of 2-20 g/m^2, preferably of 5-10 g/m^2.
and/or wherein the pre-coat formulation is essentially free of cationic components and/or wherein the overall coating charge is anionic
and/or wherein the image receiving coating is transparent
and/.or wherein the additives in the pre-coat and/or the image receiving coating are selected from the group of defoamers, colorants, brighteners, dispersants, thickeners, water retention agents, preservatives, crosslinkers, lubricants and pH control agents and mixtures thereof
and/or wherein the image receiving coating layer comprises a cationic mordant for the dye as an additive in an amount of 0.1-1.5 parts per dry weight, preferably 0.5-1 parts per dry weight

and/or wherein the pre-coat layer is essentially free of cationic mordant additives.

13. Inkjet paper according to any of the claims 6-12, wherein the colloidal silica pigment in the image receiving coating layer is a unmodified anionic colloidal silica
and/or wherein the fine particulate calcium carbonate pigment in the pre-coat is a precipitated calcium carbonate pigment, preferably a needle-shaped type and/or an anionic type.

14. Inkjet paper according to any of the claims 6 - 13, wherein the end paper has a gloss above or equal to 45% according 75°DIN, preferably above or equal to 50%, even more preferably above or equal to 55%.

15. Inkjet paper according to any of the claims 6 - 14, wherein the pre-coat and/or the receiving coating layer(s) are overall anionic.

Patentansprüche

1. Verfahren zur Herstellung eines Papiers für Tintenstrahl umfassend mindestens eine bildaufnehmende Beschichtungsschicht und mindestens eine Vorbeschichtungsschicht unterhalb besagter bildaufnehmender Beschichtungsschicht auf einem Papiersubstrat, wobei die Vorbeschichtungsschicht

100 Trockengewichtsanteile eines Pigmentanteils bestehend aus

20-75 Trockengewichtsanteile eines feinen, teilchenförmigen Kalziumkarbonats und/oder Kaolins;
10 - 70 Trockengewichtsanteile eines feinen, teilchenförmigen Silikas und/oder eines feinen, teilchenförmigen, gemahlenen Kalziumkarbonats mit einer, aus einer Behandlung mit einem oder mehreren, mittleren bis starken H_3O^+-Ionenlieferanten, und wahlweise aus zusätzlicher Behandlung mit gasförmigem Kohlenstoffdioxid resultierenden Modifikation der Oberfläche oder inneren Struktur; und
0 - 30 Anteilen eines zusätzlichen feinen, teilchenförmigen Pigments

4 - 20 Trockengewichtsanteilen eines Bindemittelanteils
0-6 Trockengewichtsanteile eines Additivs;

umfasst,
und die bildaufnehmende Beschichtungsschicht

100 Trockengewichtsanteile eines Pigmentanteils bestehend aus

50 - 100 Trockengewichtsanteile eines feinen, teilchenförmigen Silikas; und
0 - 50 Trockengewichtsanteile eines feinen, teilchenförmigen Polymerpigments; und
0 - 30 Anteilen eines zusätzlichen feinen, teilchenförmigen Pigments

2 - 10 Trockengewichtsanteile eines Bindemittels
0-3 Trockengewichtsanteile eines Additivs;

umfasst,
wobei in einem ersten Schritt die Formulierung der Vorbeschichtungsschicht mit einem Trockenanteil von oberhalb von 40% auf das Papiersubstrat aufgetragen wird und wobei anschliessend in einem zweiten Schritt die Formulierung der bildaufnehmende Beschichtungsschicht mit einem Trockenanteil von oberhalb von, oder gleich, 40% aufgetragen wird.

2. Verfahren gemäss Anspruch 1, wobei die Formulierung der Vorbeschichtungsschicht mit einem Feststoffanteil im Bereich von 50-60%, bevorzugt im Bereich von 50-55% auf das Papiersubstrat aufgetragen wird wobei die Formulierung bevorzugt anhand eines Rakelstreichverfahrens, Stabstreichverfahrens, Luftbürstenstreichverfahrens, Giessstreichverfahrens aufgetragen wird.

3. Verfahren gemäss irgendeinem der vorangehenden Ansprüche, wobei die Formulierung der bildaufnehmenden Beschichtungsschicht mit einem Feststoffanteil zwischen 40-55%, bevorzugt zwischen 40 und 50% aufgetragen wird, wobei die Formulierung bevorzugt anhand Rakelstreichverfahrens, Stabstreichverfahrens, Luftbürstenstreich-

verfahrens, Giessstreichverfahrens aufgetragen wird, und wobei bevorzugt nach Auftragen der zwei Beschichtungsschichten das Papier kalandriert wird.

4. Verfahren gemäss irgendeinem der vorangehenden Ansprüche, wobei mindestens einer der Formulierungen anhand eines Rakelstreichverfahrens aufgetragen wird, mit einer Geschwindigkeit von mehr als 600 m/min, bevorzugt mit einer Geschwindigkeit von mehr als 800 m/min, sogar bevorzugter mit einer Geschwindigkeit von mindestens 900 m/min.

5. Verfahren gemäss irgendeinem der vorangehenden Ansprüche, wobei die Vorbeschichtung und/oder die Formulierung der aufnehmenden Beschichtung in einem gesamthaft anionischen Zustand befinden.

6. Papier für Tintenstrahl, bevorzugt anhand des Verfahrens gemäss irgendeinem der vorangehenden Ansprüche hergestellt, umfassend mindestens eine bildaufnehmende Beschichtungsschicht und mindestens eine Vorbeschichtungsschicht unterhalb besagter bildaufnehmenden Beschichtungsschicht auf einem Papiersubstrat, wobei die Vorbeschichtungsschicht

100 Trockengewichtsanteile eines Pigmentanteils, bestehend aus

20-75 Trockengewichtsanteilen eines feinen, teilchenförmigen Kalziumkarbonats und/oder Kaolin;
10-70 Trockengewichtsanteilen eines feinen, teilchenförmigen Silikas und/oder eines feinen, teilchenförmigen, gemahlenen Kalziumkarbonats mit einer, aus einer Behandlung mit einem oder mehreren, mittleren bis starken H_3O^+-Ionenlieferanten, und wahlweise aus zusätzlicher Behandlung mit gasförmigem Kohlenstoffdioxid resultierenden Modifikation der Oberfläche oder inneren Struktur,
0 - 30 Anteilen eines zusätzlichen feinen, teilchenförmigen Pigments,

4 - 20 Trockengewichtsanteile eines Bindemittelanteils
0-6 Trockengewichtsanteile eines Additivs; umfasst

und die bildaufnehmende Beschichtungsschicht

100 Trockengewichtsanteile eines Pigmentanteils, bestehend aus

50 - 100 Trockengewichtsanteilen eines feinen, teilchenförmigen Silikas; und
0 - 50 Trockengewichtsanteilen eines feinen, teilchenförmigen Polymers, wie Kunststoff- und/oder Biopolymerpigment; und
0 - 30 Anteilen eines zusätzlichen feinen, teilchenförmigen Pigments

2 - 10 Trockengewichtsanteile Bindemittel
0-3 Trockengewichtsanteilen eines Additivs; umfasst.

7. Papier für Tintenstrahl gemäss Anspruch 6, wobei die Vorbeschichtungsschicht 100 Trockengewichtsanteile eines Pigmentanteils umfasst, bestehend aus

40-75 Trockengewichtsanteilen, bevorzugt 50-60 Trockengewichtsanteilen, eines feinen, gemahlenen oder gefällten Kalziumkarbonats;
25-70 Trockengewichtsanteilen, bevorzugt 40-60 Trockengewichtsanteile eines feinen, teilchenförmigen, Silikapigments und/oder eines feinen, teilchenförmigen, gemahlenen Kalziumkarbonats mit einer, aus einer Behandlung mit einem oder mehreren, mittleren bis starken H_3O^+-Ionenlieferanten, und wahlweise aus zusätzlicher Behandlung mit gasförmigem Kohlenstoffdioxid resultierenden Modifikation der Oberfläche oder inneren Struktur,

wobei bevorzugt das feine, teilchenförmige Silikapigment in der Vorbeschichtungsschicht aus 5-50, bevorzugt 10-50 Trockengewichtsanteilen eines Kolloid-Silikas und 10-40 Trockengewichtsanteilen eines Silika-Gels besteht,
und wobei bevorzugter das feine, teilchenförmige Silikapigment in der Vorbeschichtungsschicht aus 10-30, bevorzugt 15-30Trockengewichtsanteilen eines Kolloid-Silikas und 20 - 35, bevorzugt 25-35 Trockengewichtsanteilen eines Silika-Gel besteht,
und wobei sogar bevorzugter das Silika-Gel in der Vorbeschichtungsschicht eine Teilchengrössenverteilung hat, so dass die durchschnittliche Teilchengrösse im Bereich von 0.1-10 um, bevorzugt unterhalb 7 um und am bevor-

zugtesten unterhalb 4.0 um liegt und/oder das Kolloid-Silika in der Vorbeschichtungsschicht eine Teilchengrössenverteilung hat, so dass die durchschnittliche Teilchengrösse im Bereich von 10 - 120 nm, bevorzugt 40 -100 nm liegt.

8. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6 - 7, wobei der Bindemittelanteil in der Vorbeschichtungsschicht ein Latex-Bindemittel und ein zweites Bindemittel umfasst, ausgesucht aus der Gruppe von Polyvinyl-Pyrrolidon-Bindemittel, PVA, Gelatine und Mischungen hiervon, wobei bevorzugter der Bindemittelanteil 2-20, bevorzugt 2-14 Trockengewichtsanteile an Latex-Bindemittel, bevorzugt ein Styrene-Butadiene-Bindemittel und 2-8, bevorzugt 4-8 Trockengewichtsanteile an Polyvinyl-Pyrrolidon-Bindemittel, bevorzugt an Polyvinyl-Pyrrolidon mit einer Molekuargewicht von mehr als 20'000 Da, sogar bevorzugter von mehr als 30'000 Da, am bevorzugtesten im Bereich von 40'000 Da - 80'000 Da, umfasst.

9. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6-8, wobei die Vorbeschichtungsschicht 100 Trockengewichtsanteile eines Pigmenanteils, bestehend aus
50-75 Trockengewichtsanteilen, bevorzugt 40-60 Trockengewichtsanteilen, eines feinen, gemahlenen oder gefällten Kalziumkarbonats, wobei das feine, gemahlene Kalziumkarbonat eine Teilchengrössenverteilung hat, so dass 50 % der Teilchen kleiner als 1 um, bevorzugt kleiner als 0.7 um sind;
25-50 Trockengewichtsanteilen, bevorzugt 40-60 Trockengewichtsanteile eines feinen teilchenförmigen Silikapigments und/oder eines feinen, teilchenförmig, gemahlenen Kalziumkarbonats mit einer, aus einer Behandlung mit einem oder mehreren, mittleren bis starken H_3O^+-Ionenlieferanten, und wahlweise aus zusätzlicher Behandlung mit gasförmigem Kohlenstoffdioxid resultierenden Modifikation der Oberfläche oder inneren Struktur,
umfasst.

10. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6 - 9, wobei die bildaufnehmende Beschichtungsschicht

100 Trockengewichtsanteile eines Pigmentanteils, bestehend aus

60 - 100, bevorzugt 60 - 90 Trockengewichtsanteilen eines feinen, teilchenförmigen Kolloid-Silikapigments; und
0 - 40, bevorzugt 10 - 40 Trockengewichtsanteilen, bevorzugt 10-30 Trockengewichtsanteilen, eines feinen, teilchenförmigen Polymerpigments;

3 - 6 Trockengewichtsanteilen eines Bindemittels;
0-2 Trockengewichtsanteilen eines Additivs,

umfasst.

11. Papier für Tintenstrahl gemäss Anspruch 10, wobei das teilchenförmige, bevorzugt volle oder vakuolierte Polymerpigment in der bildaufnehmenden Beschichtungsschicht eine Teilchengrössenverteilung hat, so dass mehr als 90 % der Teilchen keiner als 0.5 um sind, bevorzugt mit einer Teilchengrössenverteilung so dass 90 % der Teilchen Grössen zwischen 0.05 und 0.3 um, insbesondere zwischen 0.1 und 0.2 um sind, oder im Fall eines vakuolierten Polymerpigments auch mit einer mittleren Teilchengrösse von etwa 0.6 -1 um.

12. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6 - 11, wobei der Bindemittelanteil in der bildaufnehmenden Beschichtungsschicht aus einem PVA-Bindemittel, einem PVP-Bindemittel, einem Gelatine-Bindemittel oder Mischungen hiervon besteht,
und/oder wobei die bildaufnehmende Beschichtungsschicht ein Farbstoffbeizmittel, bevorzugt 0.1-1.5, bevorzugt 0.5 - 1.5 Trockengewichtsanteilen hiervon umfasst
und/oder wobei bildaufnehmenden Beschichtung direkt angrenzend zu der Vorbeschichtungsschicht ist,
und/oder wobei die Vorbeschichtungsschicht eine Beschichtungsdicke im Bereich von 5-30 g/m^2, bevorzugt im Bereich von 10-20 g/m^2 hat , und wobei die Oberbeschichtungsschicht eine Beschichtungsdicke im Bereich von 2-20 g/m^2, bevorzugt von 5-10 g/m^2 hat,
und/oder wobei die Formulierung der Vorbeschichtung im Wesentlichen frei von kationischen Komponenten ist
und/oder wobei die allgemeine Ladung der Beschichtung anionisch ist,
und/oder wobei die bildaufnehmende Beschichtung transparent ist,
wobei die Additive im der Vorbeschichtung und/oder in der bildaufnehmenden Beschichtung ausgesucht sind aus der Gruppe der Entschäumer, Farbmittel, Aufheller, Dispergiermittel, Verdickungsmittel, Wasserretentionsmittel, Konservierungsmittel, Vernetzungsmittel, Schmiermittel, und pH-Kontrollmittel und Mischungen hiervon,
und/oder wobei die bildaufnehmende Beschichtungsschicht ein kationisches Farbstoffbeizmittel als Additiv in einer

Menge von 0.1-1.5 Trockengewichtsanteilen, bevorzugt 0.5-1 Trockengewichtsanteilen umfasst,
und/oder wobei die Vorbeschichtungsschicht im Wesentlichen frei von kationischen Beizmittel Additiven ist.

13. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6-12, wobei das Kolloid-Silikapigment in der bildaufnehmenden Beschichtungsschicht ein unmodifiziertes anionische Kolloidal-Silika ist
und/oder wobei das feine, teilchenförmige Kalziumkarbonatpigment in der Vorbeschichtung ein gefälltes Kalziumkarbonatpigment ist, bevorzugt ein nadelförmiger Typ und/oder anionischer Typ.

14. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6 - 13, wobei das Endpapier einen Glanz oberhalb von, oder gleich, 45% gemäss 75°DIN, bevorzugt oberhalb von, oder gleich, 50%, sogar bevorzugter oberhalb von, oder gleich, 55% hat.

15. Papier für Tintenstrahl gemäss irgendeinem der Ansprüche 6 - 14, wobei die Vorbeschichtung und/oder die bildaufnehmende(n) Beschichtungsschicht(en) allgemein anionisch sind.

Revendications

1. Méthode pour la production d'un papier à jet d'encre comprenant au moins une couche de revêtement récepteur d'image et au moins une couche de pré-revêtement sous ladite couche de revêtement récepteur d'image sur un papier substrat, dans laquelle
la couche de pré-revêtement comprend

100 parties en poids sec d'une partie de pigment se composant de

20-75 parties en poids sec d'un carbonate de calcium et/ou kaoline particulaire fin;
10 - 70 parties en poids sec d'un silice particulaire fin et/ou d'un carbonate de calcium particulaire fin moulu avec modification de surface et structure interne résultante d'un traitement avec un ou plusieurs fournisseurs moyens à forts de ions H_3O^+ et optionnellement avec un traitement supplémentaire au dioxyde de carbone gazeux; et
0 - 30 parties de pigments particulaires fins supplémentaires,

4 - 20 parties en poids sec d'une partie de liant
0-6 parties en poids sec d'additifs;

et la couche de revêtement récepteur d'image comprend

100 parties en poids sec d'une partie de pigment se composant de

50 - 100 parties en poids sec d'une silice particulaire fine; et
0 - 50 parties en poids sec d'un pigment polymère particulaire fin;
et
0 - 30 parts de pigments supplémentaires particulaires fins

2 - 10 parties en poids sec d'un liant,
0-3 parties en poids sec of additives,

dans laquelle, dans une première étape, la formulation de pré-revêtement est appliquée au papier substrat avec un contenu de solides au-delà de 40% et dans laquelle subséquemment, dans une deuxième étape, la formulation de couche de revêtement récepteur d'image est appliquée avec un contenu de solides au-delà de, ou égal à, 40%.

2. Méthode selon la revendication 1, dans laquelle la formulation de pré-revêtement est appliquée au papier substrat avec un contenu de solides dans le domaine de 50-60%, préférablement dans le domaine de 50-55%, dans laquelle préférablement la formulation est appliquée en utilisant le couchage à racle, couchage à barre, couchage à lame d'air, couchage à rideau.

3. Méthode selon l'une quelconque des revendications précédentes, dans laquelle la formulation de couche de revêtement récepteur d'image est appliquée avec un contenu de solides entre 40-55%, préférablement entre 40 et 50%,

dans laquelle préférablement la formulation est appliquée en utilisant le couchage à racle, couchage à barre, couchage à lame d'air, couchage à rideau, et dans laquelle préférablement après l'application des deux couches de revêtement, le papier est calandré.

4. Méthode selon l'une quelconque des revendications précédentes, dans laquelle au moins une des formulations est appliquée en utilisant le couchage à racle avec une vitesse supérieure à 600 m/min, préférablement avec une vitesse supérieure à 800 m/min, même plus préférablement avec une vitesse d'au moins 900 m/min.

5. Méthode selon l'une quelconque des revendications précédentes, dans laquelle le pré-revêtement et/ou les formulations de revêtement récepteur sont dans un état généralement anionique.

6. Papier à jet d'encre, préférablement élaboré en utilisant la méthode selon l'une quelconque des revendications précédentes, comprenant au moins une couche de revêtement récepteur d'image et au moins une couche de pré-revêtement sous ladite couche de revêtement récepteur d'image sur un papier substrat, dans lequel
la couche de pré-revêtement comprend

100 parties en poids sec d'une partie de pigment se composant de

20-75 parties en poids sec d'un carbonate de calcium et/ou kaoline particulaire fin;
10 - 70 parties en poids sec d'une silice particulaire fine et/ou d'un carbonate de calcium particulaire fin moulu avec modification de surface et structure interne résultante d'un traitement avec un ou plusieurs fournisseurs moyens à forts de ions H_3O^+ et optionnellement avec un traitement supplémentaire au dioxyde de carbone gazeux et
0 - 30 parties de pigments particulaires fins supplémentaires

4 - 20 parties en poids sec d'une partie de liant
0-6 parties en poids sec d'additifs;

et la couche de revêtement récepteur d'image comprend

100 parties en poids sec d'une partie de pigment se composant de

50 - 100 parties en poids sec d'une silice particulaire fine; et
0 - 50 parties en poids sec d'un polymère particulaire fin, comme un pigment en plastique et/ou biopolymère,; et
0 - 30 parties de pigments particulaires fins supplémentaires

2 - 10 parties en poids sec d'un liant
0-3 parties en poids sec d'additifs.

7. Papier à jet d'encre selon la revendication 6, dans laquelle la couche de pré-revêtement comprend 100 parties en poids sec d'une partie de pigment se composant de

40-75 parties en poids sec, préférablement 50-60 parties en poids sec, d'un carbonate de calcium fin particulaire, moulu ou précipité;
25-70 parties en poids sec, préférablement 40-60 parties en poids sec d'un pigment de silice fin particulaire et/ou d'un carbonate de calcium of a particulaire fin moulu avec modification de surface et structure interne résultante d'un traitement avec un ou plusieurs fournisseurs moyens à forts de ions H_3O^+ et optionnellement avec un traitement supplémentaire au dioxyde de carbone gazeux,

dans lequel préférablement le pigment de silice particulaire fin dans la couche de pré-revêtement est composé de 5 - 50, préférablement 10-50 parties en poids sec d'une silice colloïdale et 10-40 parties en poids sec d'un gel de silice, et dans lequel plus préférablement le pigment de silice particulaire fin dans la couche de pré-revêtement est composé de 10 - 30, préférablement 15-30 parties en poids sec d'une silice colloïdale et 20-35, préférablement 25-35 parties en poids sec d'un gel de silice,
et dans lequel même plus préférablement le gel de silice dans la couche de pré-revêtement a une distribution de taille de particules de manière à ce que la taille moyenne de particule est dans le domaine de 0.1-10 um, préférablement en dessous de 7 um et plus préférablement en dessous de 4.0 um et/ou la silice colloïdale dans la couche

de pré-revêtement a une distribution de taille de particules de manière à ce que la taille moyenne de particule est dans le domaine de 10 - 120 nm, préférablement 40 - 100 nm.

8. Papier à jet d'encre selon l'une quelconque des revendications 6 - 7, dans lequel la partie de liant dans la couche de pré-revêtement comprend un liant latex et un deuxième liant choisi du groupe de liants polyvinyle-pyrrolidone, PVA, gelatine et mélanges de ceux-ci, dans lequel plus préférablement la partie de liant comprend 2-20, préférablement 2-14 parties en poids sec d'un liant latex, préférablement un liant styrène-butadiène et 2-8, préférablement 4-8 parties en poids sec d'un liant polyvinyle-pyrrolidone, préférablement de polyvinyle-pyrrolidone avec un poids moléculaire de plus de 20'000 Da, même plus préférablement de plus de 30'000 Da, plus préférablement dans le domaine de 40'000 Da - 80'000 Da.

9. Papier à jet d'encre selon l'une quelconque des revendications 6-8, dans lequel la couche de pré-revêtement comprend 100 parties en poids sec d'une partie de pigment se composant de

50-75 parties en poids sec, préférablement 40-60 parties en poids sec, d'un carbonate de calcium fin Particulaire, moulu ou précipité, dans lequel le carbonate de calcium particulaire fin a une distribution de taille de particules de manière à ce que 50 % des particules sont inférieures à 1 um, préférablement inférieures à 0.7 um;
25-50 parties en poids sec, préférablement 40-60 parties en poids sec d'un pigment de silice fin particulier et/ou d'un carbonate de calcium particulaire fin moulu avec modification de surface et structure interne résultante d'un traitement avec un ou plusieurs fournisseurs moyens à forts de ions H_3O^+ et optionnellement avec un traitement supplémentaire au dioxyde de carbone gazeux.

10. Papier à jet d'encre selon l'une quelconque des revendications 6 - 9, dans lequel la couche de revêtement récepteur d'image comprend

100 parties en poids sec d'une partie de pigment se composant de

60 - 100, préférablement 60 - 90 parties en poids sec d'un pigment de silice particulaire fine colloïdale ; et
0 - 40, préférablement 10 - 40 parties en poids sec, préférablement 10-30 parties en poids sec, d'un pigment polymère particulaire fin;

3 - 6 parties en poids sec d'un liant
0-2 parties en poids sec d'additifs.

11. Papier à jet d'encre selon la revendication 10, dans lequel le pigment polymère particulaire, préférablement solide ou vacuolé dans la couche de revêtement récepteur d'image a une distribution de taille de particules de manière à ce que plus de 90 % des particules sont inférieures à 0.5 um, préférablement avec une distribution de taille de particules de manière à ce que 90 % of the particules ont des tailles entre 0.05 et 0.3 um, en particulier entre 0.1 et 0.2 um, ou dans le cas d'un pigment polymère vacuolé aussi avec taille de particules moyenne d'environ 0.6 -1 um.

12. Papier à jet d'encre selon l'une quelconque des revendications 6 - 11, dans lequel la partie de liant dans la couche de revêtement récepteur d'image se compose d'un liant PVA, d'un liant PVP, d'un liant gélatine ou de mélanges de ceux-ci
et/ou dans lequel la couche de revêtement récepteur d'image comprend un mordant pour colorants, préférablement 0.1-1.5, préférablement 0.5 - 1.5 parties en poids sec de celui-ci
et/ou dans lequel le revêtement récepteur d'image est directement adjacent à la couche de pré-revêtement
et/ou dans lequel la couche de pré-revêtement a une épaisseur de couche dans le domaine de 5-30 g/m^2, préférablement dans le domaine de 10-20 g/m^2, et dans lequel la couche de revêtement supérieur a une épaisseur de couche dans le domaine de 2-20 g/m^2, préférablement de 5-10 g/m^2
et/ou dans lequel la formulation de pré-revêtement est essentiellement libre de composantes cationiques
et/ou dans lequel la charge du revêtement est généralement anionique
et/ou dans lequel le revêtement récepteur d'image est transparent
et/ou dans lequel les additifs dans le pré-revêtement et/ou le revêtement récepteur d'image sont choisis du groupe de antimoussants, colorants, azurants, dispersants, épaississants, agents de rétention d'eau, conservateurs, agent de réticulation, lubrifiants et agents de contrôle de pH agents et mélanges de ceux-ci,
et/ou dans lequel la couche de revêtement récepteur d'image comprend un mordant pour colorants cationique comme additif dans une quantité de 0.1-1.5 parties par poids sec, préférablement 0.5-1 parties par poids sec

et/ou dans lequel la couche de pré-revêtement est essentiellement libre d'additifs mordants cationiques.

13. Papier à jet d'encre selon l'une quelconque des revendications 6-12, dans lequel le pigment de silice colloïdale dans la couche de revêtement récepteur d'image est une silice non-modifiée anionique colloïdale et/ou dans lequel le pigment de carbonate de calcium particulaire fin dans le pré-revêtement est un pigment carbonate de calcium précipité, préférablement du type en forme d'aiguille et/ou du type anionique.

14. Papier à jet d'encre selon l'une quelconque des revendications 6 - 13, dans laquelle le papier de fin a un brillance au-delà de, ou égale à, 45% selon 75° DIN, préférablement au-delà de, ou égale à, 50%, même plus préférablement au-delà de, ou égale à, 55%.

15. Papier à jet d'encre selon l'une quelconque des revendications 6 - 14, dans laquelle le pré-revêtement et/ou la(les) couche(s) de revêtement récepteur sont généralement anionique(s).

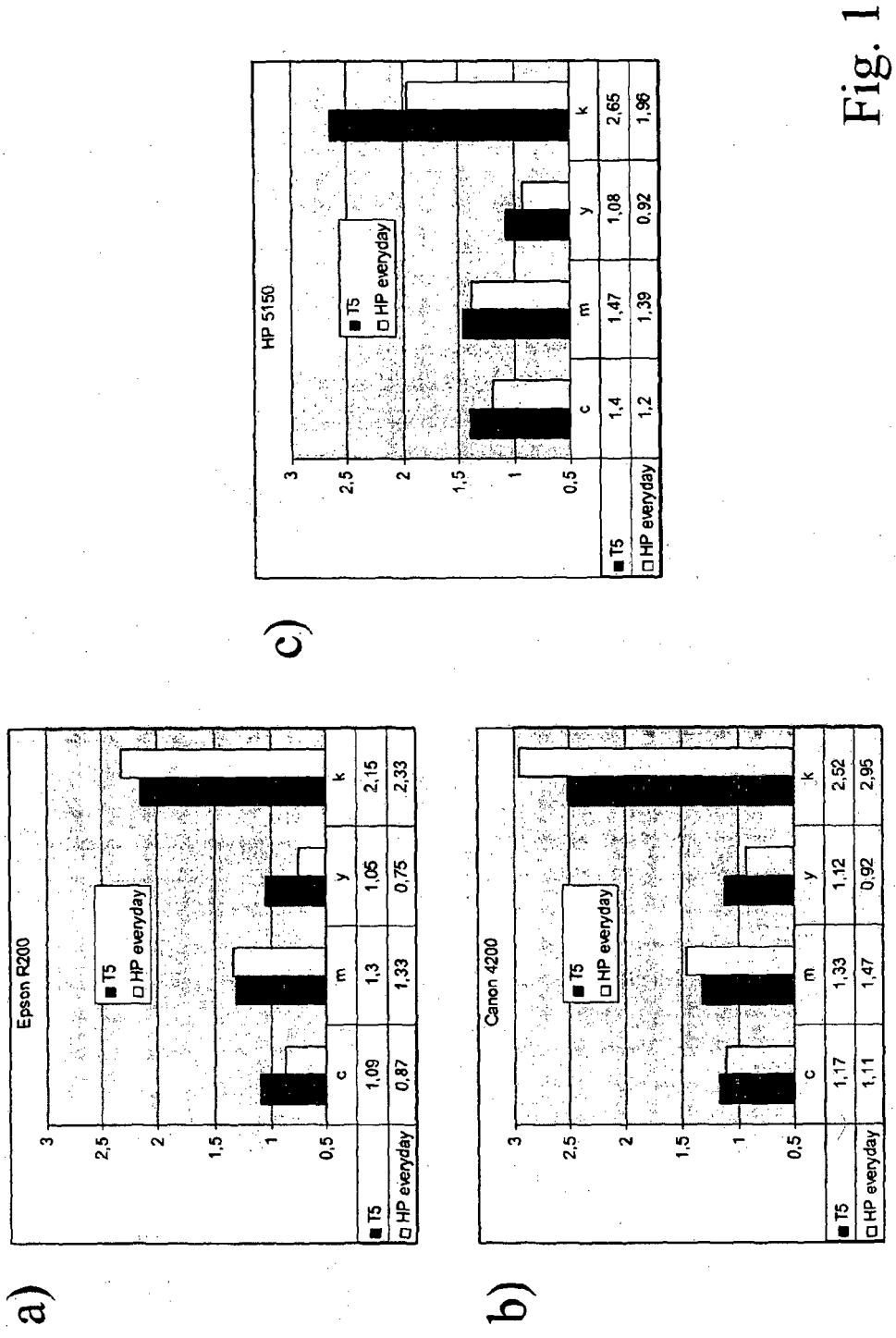

a)
Epson R200
T5
HP everyday
c
m
y
k
T5 1,09 1,3 1,05 2,15
HP everyday 0,87 1,33 0,75 2,33
b)
Canon 4200
T5
HP everyday
c
m
y
k
T5 1,17 1,33 1,12 2,52
HP everyday 1,11 1,47 0,92 2,95
c)
HP 5150
T5
HP everyday
c
m
y
k
T5 1,4 1,47 1,08 2,65
HP everyday 1,2 1,39 0,92 1,96

Fig. 1

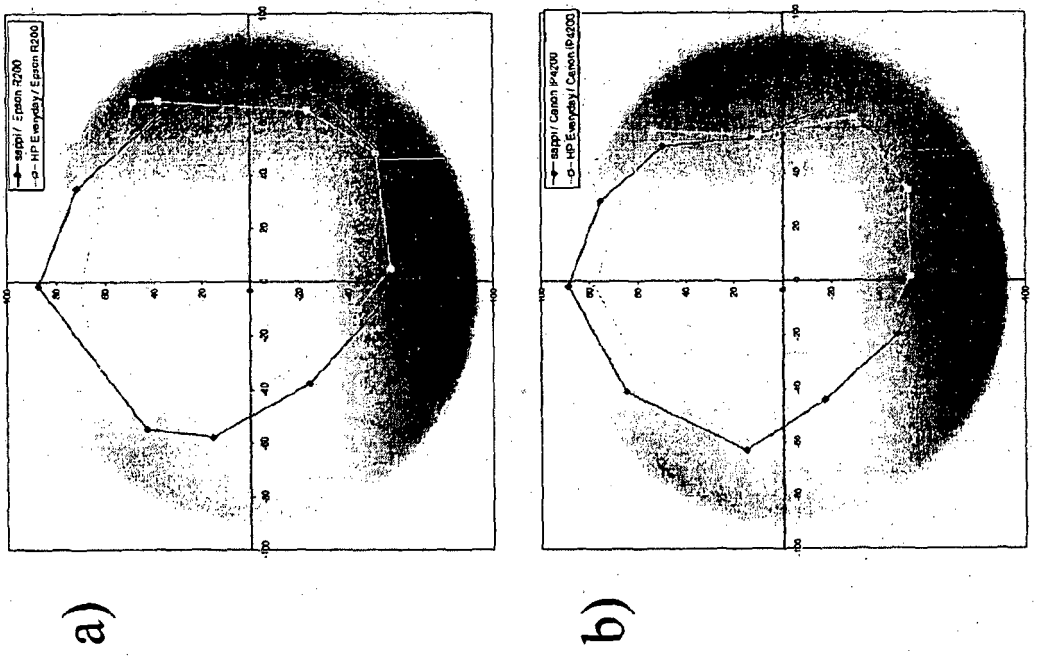

a)
sappi / Epson 2200
HP Everyday / Epson R200
b)
sappi / Canon IP4200
HP Everyday / Canon IP4200
c)
sappi HP / Deskjet 5150
HP Everyday / HP Deskjet 5150

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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