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(54) **PLANOGRAPHIC PRINTING**

FLACHDRUCK

IMPRESSION A PLAT

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EP 0 984 863 B1

Description

[0001] This invention relates to planographic printing and provides a substrate for a planographic printing member and a planographic printing member per se. The invention particularly, although not exclusively, relates to lithographic printing.

[0002] Lithographic processes involve establishing image (printing) and non-image (non-printing) areas on a substrate, substantially on a common plane. When such processes are used in printing industries, non-image areas and image areas are arranged to have different affinities for printing ink. For example, non-image areas may be generally hydrophilic or oleophobic and image areas may be oleophilic. In "wet" lithographic printing, a dampening or fountain (water-based) liquid is, in general, applied initially to a plate prior to application of ink so that it adheres to the non-image areas and repels oil based inks therefrom. In "dry" printing, ink is repelled from non-image areas due to their release property.

[0003] Image and non-image areas can be created by processes which include a step of exposing a layer of image material on the surface of the substrate to radiation. The exposure to radiation creates solubility differences in the image material corresponding to image and non-image areas. During development, the more soluble areas are removed, leaving a pattern on the substrate corresponding to the image.

[0004] The properties of lithographic plates are highly dependent on the substrate itself and particularly its uppermost surface, since it is this surface which must bond with image material prior to imaging of the plate but allow release of soluble image material during development and, furthermore, it must be non-ink accepting and thereby define non-image areas of the plate.

[0005] Other important properties affected by the substrate may include the following:

a) the shape of dots (or other printing areas) on the plate;
b) the resolution obtainable using the plate;
c) the range of dots obtainable using the plate;
d) the exposure latitude of the plate;
e) the ink-water balance of the plate;
f) the number of prints obtainable using (and, therefore, the durability of) the plate;
g) the speed of the plate;
h) the tendency of the plate to pick-up ink in non-image areas;
i) the aesthetics of the plate pre- and post-development.

[0006] The accurate reproduction of dots (or other printing areas) in terms of their size and/or shape (e.g. properties a) to c)) is becoming more and more important for use in applications such as stochastic printing and/or high quality colour printing. Accordingly, plates that can accurately reproduce dots and have other advantageous properties are highly desirable. In addition, there is some evidence of a movement in the printing field towards plates with a wider exposure latitude (property d)). Properties such as e), f) and h) are properties that always need to be optimised whilst property i) is a desirable property to optimise, since good plate aesthetics may affect a printer's perception of the quality of a plate and make it easier for the printer to inspect the quality of an image produced, for example pre- or post-development.

[0007] One of the most common substrates used in lithographic printing comprises an aluminium base layer which is treated to make it ready for use. For example, the aluminium may be roughened, for example by electrograining, anodized and then conditioned by chemical means, for example by treatment with water, a solution of phosphate or silicate salt, or a polycarboxylic acid.

[0008] However, one problem associated with the use of an electrograined and anodized aluminium substrate is its poor ability to accurately reproduce dots. Another problem is the expense (both economically and environmentally) of preparing the substrate.

[0009] It is also well-known to prepare a substrate by applying a hydrophilic layer on a support of, for example, aluminium or plastics. Numerous different hydrophilic layers have been proposed which possess a whole range of chemistries and morphologies. However, very few printing plates of the type described have been commercialised. Those that have tend to have poor properties and are generally used for low quality, short run length applications.

[0010] EP-A-514 312 discloses an offset printing plate comprising an aluminium substrate and a ceramic layer of sodium and/or potassium silicate thereupon, the ceramic coating having a roughness value Ra of between 0.3 and 0.9.

[0011] It is an object of the present invention to address problems associated with known printing members.

[0012] According to a first aspect of the invention, there is provided a printing member comprising:

a substrate which comprises a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material;

wherein said printing member carries information in a stochastic form.

[0013] It has been found that if the Ra is too low then the adhesion of the image layer is poor and run length is accordingly low. On the other hand, if Ra is too high, then properties a) to d) and g) are detrimentally affected.

[0014] various types of instruments are known for the measurement of Ra. For example Ra may be measured using a Talkysurf Plus unit fitted with a 112/2564-430 head, supplied by Rank Taylor Hobson Inc of Leicester, U.K.

[0015] The Ra may be at least 0.2 μm, suitably at least 0.25 μm, preferably at least 0.3 μm, more preferably at least 0.35 μm, especially at least 0.4 μm. The Ra may be less than 1.5 μm, suitably less than 1 μm, preferably less than 0.8 μm, more preferably less than 0.7 μm, especially less than 0.6 μm, most preferably less than 0.5 μm.

[0016] The Ra in a first direction, across the plate is preferably substantially the same as the Ra perpendicular to said first direction.

[0017] Confirmation that the hydrophilic layer comprises a particulate material and a binder can be made by the use of Scanning Electron Microscopy (SEM) as described in Assessment 5 hereinafter.

[0018] The hydrophilic layer may have a surface skewness (Ssk) of greater than -0.5, preferably greater than -0.2, more preferably greater than 0, especially greater than 0.5, most preferably greater than 1.0. The Ssk may be less than 2.0, preferably less than 1.5, more preferably less than 1.4, especially less than 1.2.

[0019] Ssk may be measured using any suitable instrument. A stylus measuring instrument is preferably used, such as a Rank Taylor Hobson Form Talysurf 3D unit fitted with a stylus of radius 2 μm as described in Assessment 2 hereinafter.

[0020] Preferably, an elemental analysis of the hydrophilic layer, especially the binder thereof, shows that it includes the elements silicon and oxygen. Preferably, elemental analysis shows that the hydrophilic layer includes the element aluminium. Preferably, the analysis shows the layer includes the element titanium. The elemental analysis may be carried out using Energy Dispersive X-ray analysis (EDX), for example as described in Assessment 6 hereinafter. The % of silicon measured as described in Assessment 6 is preferably in the range 10%-20%, more preferably 11% - 17%. The % of oxygen measured the same way is preferably in the range 5% - 12%, more preferably 7% - 11%. The % of aluminium measured in the same way is preferably in the range 40% - 60%, more preferably 45% - 55%. The % titanium is preferably in the range 15% - 30%, more preferably 19% - 25% (when assessing the K alpha electron energy level).

[0021] The ratio of Ti : Al in the hydrophilic layer may be in the range 0.5 to 2, preferably 0.75 to 1.25, more preferably 0.9 to 1.1. The ratio of (Al+Ti) : si in the layer may be in the range 1 to 10, preferably 2 to 6, more preferably 3 to 5.

[0022] Preferably, a reflectance FT-IR spectrum of the hydrophilic layer has at least one peak in one (but preferably has at least one peak in each) of the following ranges: 1200 to 1300 cm^{-1} (especially in the range 1220 to 1280 cm^{-1}), 1100 to 1200 cm^{-1} (especially in the range 1130 to 1190 cm^{-1}) and 900 to 1000 cm^{-1} (especially in the range 920 to 980 cm^{-1}).

[0023] Preferably, a UV-VIS absorbence spectrum shows that, on lowering the wavelength, absorbence starts to increase rapidly at a wavelength in the range 380 to 430 nm, preferably 390 to 420 nm and reaches a value of greater than 1.

[0024] Said hydrophilic layer preferably includes a material having Si-O bonds. Preferably, the binder includes said material having Si-O bonds. Said binder material may be a component of a polymeric material which includes Si-O bonds. Said polymeric material may include -Si-O-Si-, especially -Si-O-Si-O- moieties.

[0025] At least 50 wt%, suitably at least 60 wt%, preferably at least 70 wt%, more preferably at least 80 wt%, especially at least 90 wt% of said binder material is made up of a polymeric material having Si-O bonds as described. Preferably, said binder material consists essentially of a polymeric material having Si-O bonds as described.

[0026] Said binder material may make up at least 5 wt%, preferably at least 10 wt%, more preferably at least 15 wt%, especially at least 20 wt% of said hydrophilic layer. Said binder material may make up less than 50 wt%, preferably less than 40 wt%, more preferably less than 30 wt%, especially less than 25 wt%, of said hydrophilic layer.

[0027] Said binder material may be derived or derivable from a silicate material for example water glasses, metasilicates, orthosilicates, sesquisilicates and modified silicates such as borosilicate and phosphosilicate. Said binder material is preferably derived or derivable from a silicate solution.

[0028] Said binder material preferably includes less than 10 wt%, preferably less than 5 wt%, more preferably less than 1 wt%, especially substantially no, organic material, for example polymeric organic material.

[0029] Said particulate material is preferably dispersed in said binder material. Suitably, 30 to 85 wt%, preferably 40 to 80 wt%, more preferably 50 to 80 wt%, especially 60 to 80 wt% of said hydrophilic layer is composed of said particulate material.

[0030] Said particulate material may be organic or inorganic. Organic particulate materials may be provided by latexes or organosols or polymeric balls, such as of nylon. Inorganic particulate materials may be selected from alumina, silica, silicon carbide, zinc sulphide, zirconia, barium sulphate, talcs, clays (e.g. kaolin), lithopone and titanium oxide.

[0031] Said particulate material may comprise a first particulate material. Said first material may have a hardness of greater than 8 Modified Mohs (on a scale of 0 to 15), preferably greater than 9 and, more preferably, greater than 10 Modified Mohs. Said first material may comprise generally spherical particles. Alternatively, said material may comprise

flattened particles or platelets. Said first material may have a mean particle size of at least 0.1 μm, preferably at least 0.5 μm and, more preferably at least 1 μm. Said first material may have a mean particle size of less than 200 μm, suitably less than 100 μm, preferably less than 45 μm, more preferably less than 20 μm, especially less than 10 μm and, most preferably, less than 5 μm. The particle size distribution for 95% of particles of the first material may be in the range 0.01 to 150 μm, preferably in the range 0.05 to 75 μm, more preferably in the range 0.05 to 30 μm. Said first material preferably comprises an inorganic material. Said first material preferably comprises alumina which term includes Al_2O_3 and hydrates thereof, for example $Al_2O_3.3H_2O$. Preferably, said material is Al_2O_3.

[0032] Said hydrophilic layer may include at least 10 wt%, suitably at least 20 wt%, preferably at least 25 wt%, more preferably at least 30 wt%, especially at least 35 wt% of said first particulate material. Said hydrophilic layer may include less than 80 wt%, suitably less than 70 wt%, preferably less than 60 wt%, more preferably less than 50 wt%, especially less than 40 wt% of said first particulate material.

[0033] The ratio of the wt% of said first particulate material to binder material may be in the range 0.5 to 2, preferably in the range 1 to 2, more preferably in the range 1.4.to 1.8.

[0034] Said particulate material may comprise a second particulate material. Said second particulate material may have a mean particle size of at least 0.001 μm, suitably at least 0.005 μm, preferably at least 0.01 μm, more preferably at least 0.05 μm, especially at least 0.1 μm. Said mean particle size may be less than 200 μm, suitably less than 100 μm, preferably less than 50 μm, more preferably less than 10 μm, especially less than μm, most preferably less than 0.5 μm.

[0035] Said hydrophilic layer may include at least 10 wt%, suitably at least 20 wt%, preferably at least 25 wt%, more preferably at least 30 wt%, especially at least 35 wt% of said second particulate material. Said hydrophilic layer may include less than 80 wt%, suitably less than 70 wt%, preferably less than 60 wt%, more preferably less than 50 wt%, especially less than 40 wt% of said second particulate material.

[0036] Said second material is preferably a pigment. Said second material is preferably inorganic. Said second material is preferably titanium dioxide.

[0037] The ratio of the wt% of said second particulate material to binder material may be in the range 0.5 to 2, preferably in the range 1 to 2, more preferably in the range 1.4 to 1.8.

[0038] Said first and second materials preferably define a multimodal, for example a bimodal particle size distribution.

[0039] The ratio of the wt% of said first particulate material to said second particulate material may be in the range 0.3 to 3, preferably 0.5 to 2, more preferably 0.75 to 1.33, especially about 1 : 1.

[0040] Said hydrophilic layer may include one or more additional materials for improving its adhesion to a support, especially a plastics support. A preferred additional material is organic and is preferably polymeric. Resins are preferred.

[0041] Said support may comprise a metal layer. Preferred metals include aluminium, zinc and titanium, with aluminium being especially preferred. Said support may comprise an alloy of the aforesaid metals. Other alloys that may be used include brass and steel, for example stainless steel.

[0042] Said support may comprise a non-metal layer. Preferred non-metal layers include layers of plastics, paper or the like. Preferred plastics include polyester, especially polyethylene terephthlate.

[0043] Said support may include one or a plurality of layers. Where the support comprises a plurality of layers, it may comprise a plastics, paper or textile layer and another layer. Said other layer may be a metal layer, suitably of a type described above. In this case, said support may comprise a metal to plastics or paper laminate; or metal may be applied by other means to plastics or paper, for example by sputtering or the like.

[0044] Said support may be any type of support used in printing. For example, it may comprise a cylinder or, preferably, a plate. Said support may have a width of at least 10 cm, suitably at least 20 cm, preferably at least 30 cm, more preferably at least 40 cm, especially at least 50 cm. Said support may have a width of less than 300 cm, suitably less than 200 cm, preferably less than 160 cm, more preferably less than 100 cm, especially less than 80 cm.

[0045] Said support may comprise a web of material which may have a width as described above. Preferably the web has a width in the range 0.7 m to 1.5 m.

[0046] Said support may have a length of at least 20 cm, suitably at least 40 cm, preferably at least 60 cm. Said support may have a length of less than 300 cm, suitably less than 250 cm, preferably less than 200 cm, more preferably less than 150 cm, especially less than 105 cm. The support suitably does not have a length of about 35 cm.

[0047] Said support may have a thickness of at least 0.1 mm. Said support may have a thickness of less than 0.6 mm.

[0048] Said support may be pretreated prior to the application of said hydrophilic layer by one or more conventional methods used in the surface treatment of aluminium or other supports, for example caustic etch cleaning, solvent etching, acid cleaning, brush graining, mechanical graining, slurry graining, sand blasting, abrasive cleaning, electrocleaning, solvent degreasing, ultrasonic cleaning, alkali non-etch cleaning, primer coating, flame treatment, grit/shot blasting and electrograining. Details of such methods are provided in: "The surface treatment and finishing of aluminium and its alloys" S. Wernick, R. Pinner and P. G. Sheasby published by Finishing Publication Ltd., ASM International, 5th edition 1987.

[0049] Said support may be provided with a roughened surface over which the hydrophilic layer may be provided.

Alternatively, a subbing layer or layers may be provided over the support.

[0050] The substrate may have a whiteness (L) value of at least 75, preferably at least 80, more preferably at least 82. The substrate may have a whiteness value of less than 100, preferably less than 90, more preferably less than 87.

[0051] The substrate may have a gloss value of at least 5, preferably at least 7, more preferably at least 9. The substrate may have a gloss value of less than 20, preferably less than 18, more preferably less than 15, especially less than 13.

[0052] Said hydrophilic layer may have an average thickness of less than 100 μm, suitably less than 50 μm, preferably less than 20 μm, more preferably less than 10 μm, especially less than 5 μm. In some cases, the layer may have an average thickness of less than 3 μm. Said hydrophilic layer may have an average thickness of greater than 0.1 μm, suitably greater than 0.3 μm, preferably greater than 0.5 μm, more preferably greater than 1 μm.

[0053] Said hydrophilic layer may include 1 to 20 g of material per metre squared of substrate. Preferably said layer includes 3 to 20 g, more preferably 5 to 18 g, of material per metre squared of substrate. Most preferably, said layer includes 8 to 16 g of material per metre squared.

[0054] Preferably, substantially the entire hydrophilic layer can be removed by immersing a support including the layer in a stripping solution at a temperature of 96°C for 20 minutes and rubbing cotton wool over the layer. The stripping solution may comprise potassium dichromate (160g), phosphoric acid (85%, 460g) and water (2700g). Removal of the layer as described may enable the weight of the hydrophilic layer to be assessed.

[0055] According to a second aspect, there is provided a printing member comprising a substrate as described according to said first aspect and an image layer.

[0056] Unless otherwise stated or unless the context otherwise requires, the assessment as to whether a substrate of a printing member is as described according to said first aspect may involve removing the image layer, for example by exposure and/or development.

[0057] The term "image layer" includes a layer that can subsequently be partially removed in order to define areas to be printed and includes a layer which already defines areas to be printed. Said image layer may include one or a plurality of layers.

[0058] Said image layer is preferably arranged to be removed during or after exposure to radiation, in order to define areas to be printed.

[0059] It has been found that printing members which are imaged using, for example UV radiation, visible light thermal IR radiation can all benefit from using a substrate of the type described, as can printing members prepared by depositing an image layer information-wise on the substrate.

[0060] The printing member may be processible to a resolution of 10 μm or less, suitably 9 μm or less, preferably 8 μm or less, more preferably 7 μm or less, especially 6.5 μm or less.

[0061] Resolution is preferably assessed as described under point 2 in Praxis Report 34 (June 1996) (except that the modification described in Assessment 11 hereinafter is followed) published by FOGRA Forschungsgesellschaft Druck e.V of Munich, Germany and the contents of the report are incorporated herein by reference.

[0062] The printing member may be processible to give dots having a roundness of less than 2, preferably less than 1.8, more preferably less than 1.6, especially less than 1.4, when the image is digitised to a resolution of 1.32 pixels. μm^{-1}.

[0063] Roundness may be assessed by capturing an image of exposed 5% UGRA dot screen areas, determining the dot area (a) and the dot perimeter (b) and calculating roundness according to the formula : roundness = $b^2/4\pi a$.

[0064] The printing member may have a broad exposure latitude, suitably of greater than 1.2, preferably greater than 1.3, more preferably greater than 1.35, especially greater than 1.4.

[0065] Exposure latitude may be assessed as described under point 7 in the Praxis Report 34 referred to above (except that the modification described in Assessment 12 hereinafter is preferably followed).

[0066] The printing member may have a broad dot range, following exposure and development conditions that give rise to a Stouffer Clear 3, suitably of 99% or greater, preferably 99.5% or greater at one extreme; and 2.0% or less, preferably 1.0% or less at the other extreme.

[0067] The dot range may be assessed as described under point 6 in the Praxis Report 34 referred to above.

[0068] The printing member may be for use in stochastic printing, wherein image areas include dots of less than 20 μm maximum diameter, suitably less than 18 μm maximum diameter, preferably less than 16 μm maximum diameter, more preferably less than 15 μm maximum diameter, especially less than 14 μm maximum diameter are intended to be produced.

[0069] Said printing member is preferably capable of printing an area, for example a dot, having a maximum diameter of less than 30 μm, preferably less than 25 μm, more preferably less than 20 μm.

[0070] In a preferred embodiment, a method of preparing a substrate for a planographic printing member may include the step of forming a hydrophilic layer on a support by contacting the support with a fluid comprising a silicate solution in which particulate material as described in any statement herein is dispersed.

[0071] Said silicate solution may comprise a solution of any soluble silicate including compounds often referred to

as water glasses, metasilicates, orthosilicates and sesquisilicates. Said silicate solution may comprise a solution of a modified silicate for example a borosilicate or phosphosilicate.

[0072] Said silicate solution may comprise one or more, preferably only one, metal or non-metal silicate. A metal silicate may be an alkali metal silicate. A non-metal silicate may be quaternary ammonium silicate.

[0073] Said silicate solution may be formed from silicate wherein the ratio of the number of moles of Si species, for example SiO_2, to the number of moles of cationic, for example metal species is in the range 0.25 to 10, preferably in the range 0.25 to about 6, more preferably in the range 0.5 to 4.

[0074] Said silicate is preferably alkali metal silicate. In this case, the ratio of the number of moles of SiO_2 to the number of moles of M_2O in said silicate, where M represents an alkali metal may be at least 0.25, suitably at least 0.5, preferably at least 1, more preferably at least 1.5. Especially preferred is the case wherein said ratio is at least 2.5. Said ratio may be less than 6, preferably less than 5 and more preferably less than 4.

[0075] Preferred alkali metal silicates include lithium, sodium and potassium silicates, with lithium and/or sodium silicate being especially preferred. A silicate solution comprising only sodium silicate is most preferred.

[0076] Said fluid may comprise 2 to 30 wt% of silicate (e.g. dissolved sodium silicate solid), preferably 5 to 20 wt%, more preferably 8 to 16 wt%. The fluid may be prepared using 10 to 60 wt%, preferably 30 to 50 wt%, more preferably 35 to 45 wt% of a silicate solution which comprises 30 to 40 wt% silicate.

[0077] Said fluid may include 5 to 60 wt% of particulate material. Preferably, the fluid includes 10 to 50 wt%, more preferably 15 to 45 wt%, especially 20 to 40 wt% of particulate material.

[0078] The ratio of the weight of silicate to the weight of particulate material in the fluid is preferably in the range 0.1 to 2 and, more preferably, in the range 0.1 to 1. Especially preferred is the case wherein the ratio is in the range 0.2 to 0.6.

[0079] Said fluid may include more than 20 wt%, preferably more than 30 wt%, more preferably more than 40 wt%, especially more than 45 wt% water (including water included in said silicate solution). Said fluid may include less than 80 wt%, preferably less than 70 wt%, more preferably less than 65 wt%, especially less than about 60 wt% water.

[0080] Where the fluid comprises a silicate and said particulate material comprises a first material and a second material as described, the ratio of the wt% of silicate (e.g. dissolved sodium silicate solid) to the wt% of said first material may be in the range 0.25 to 4, preferably in the range 0.5 to 1.5 and more preferably about 1. Similarly, the ratio of the wt% of silicate to the wt% of said second material may be in the range 0.25 to 4, preferably in the range 0.5 to 1.5 and more preferably about 1. The ratio of the wt% of first material to the wt% of second material may be in the range 0.5 to 2, preferably in the range 0.75 to 1.5, more preferably about 1 to 1.

[0081] Said particulate material may include a third material which is preferably adapted to lower the pH of the fluid. Said third material may be a colloid, suitably colloidal silica or an inorganic salt, suitably a phosphate, with aluminium phosphate being preferred. Where a third material is provided, preferably less than 30wt% more preferably less than 20wt%, especially less than 10wt% of said particulate material is comprised by said third material.

[0082] The pH of said fluid may be greater than 9.0, is preferably greater than 9.5 and, more preferably, greater than 10.0. Especially preferred is the case wherein the pH is greater than 10.5. The pH is suitably controlled so that the silicate remains in solution and does not form a gel. A gel is generally formed when the pH of a silicate solution falls below pH9. The pH of said fluid is preferably less than 14, more preferably less than 13.

[0083] The fluid may include other compounds for adjusting its properties. For example, the fluid may include one or more surfactants. Said fluid may include 0 to 1 wt% of surfactant(s). A suitable class of surfactants comprises anionic sulphates or sulphonates. The fluid may include viscosity builders for adjusting the viscosity of the fluid. Said fluid may include 0 to 10 wt%, preferably 0 to 5 wt% of viscosity builder(s). Also, the fluid may include dispersants for dispersing the inorganic particulate material throughout the fluid. Said fluid may include 0 to 2 wt% of dispersant(s). A suitable dispersant may be sodium hexametaphosphate.

[0084] Said fluid may have a viscosity of less than 100 centipoise when measured at 20°C and a shear rate of $200s^{-1}$ using a Mettler Rheomat 180 Viscometer incorporating a double gap measuring geometry. Preferably, said viscosity is less than 50 centipoise, more preferably less than 30 centipoise when measured as aforesaid. Especially preferred is the case wherein the viscosity is less than 20 centipoise.

[0085] Said fluid may be applied to said support by any suitable means which is preferably non-electrochemical.

[0086] Said fluid may be applied to both sides of said support in order to form a hydrophilic layer on both sides. A support with such a layer on both sides may be used to prepare a double-sided lithographic plate. Alternatively, if such a support is used for a single-sided plate, the side of the plate which does not carry an image layer may be protected by the hydrophilic layer. Said fluid is preferably applied to only one surface of said support.

[0087] Said fluid may be applied to said support to form a hydrophilic layer having an average thickness after drying, of less than 20 μm, preferably less than 10 μm and, more preferably, less than 5 μm. Especially preferred is the case wherein the average thickness is less than 3 μm.

[0088] The method preferably includes the steps of providing suitable conditions for the removal of water from the fluid after it has been applied to the support. Suitable conditions may involve passive or active removal of water and may comprise causing an air flow over the support and/or adjusting the humidity of air surrounding the support. Pref-

erably, the method includes the step of arranging the support in a heated environment. The support may be placed in an environment so that its temperature does not exceed 230°C, preferably does not exceed 200°C and, more preferably, does not exceed 175°C. Especially preferred is the case wherein the support temperature does not exceed 150°C.

[0089] The support may be arranged in the heated environment for less than 180 seconds, preferably less than 120 seconds and, more preferably, less than 100 seconds.

[0090] The invention extends to a method of stochastic or colour printing, the method using a printing member which includes a substrate comprising a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material.

[0091] The invention extends to the use of a printing member comprising a substrate which comprises a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material, in stochastic printing or colour printing.

[0092] The invention will now be described by way of Example with reference to the accompanying figures, wherein:

Figure 1 is a reflectance FT-IR spectrum of the substrate of Example 1;

Figure 2 is a UV-VIS absorbence spectrum of the substrate of Example 1;

Figures 3 and 4 are SEMs of dots produced using the plates of respective Examples 1 and C1;

Figures 5 and 6 are computer generated masks of dots produced using the plates of respective Examples 1 and C1; and

Figures 7 and 8 are resolution graphs for the respective plates of examples 1 and C1.

A. Preparation of lithographic printing plate.

Example 1

Step 1

Preparation of Aluminium

[0093] A 0.2 mm gauge aluminium alloy sheet of designation AA1050 was cut to a size of 459 mm by 525 mm. The sheet was then immersed face up in a solution of sodium hydroxide dissolved in distilled water (100g/l) at ambient temperature for 60 seconds and thoroughly rinsed with water.

Step 2

Preparation of coating formulation

[0094] The following reagents are used in the preparation:

- Sodium silicate solution having a ratio SiO_2 : Na_2O in the range 3.17 to 3.45 (average about 3.3); a composition of 27.1 - 28.1 wt% SiO_2, 8.4 - 8.8 wt% Na_2O, with the balance being water; and a density of about 75 Twaddel (°Tw), equivalent to 39.5 Baumé (°Bé) and a specific gravity of 1.375.
- Deionised water having a resistivity of 5 Mohm.cm
- Al_2O_3 powder comprising alumina (99.6%) in the shape of hexagonal platelets. The mean particle size is 3 μm. The powder has a hardness of 9 Moh (on a 0 - 10 hardness scale).
- Anatase titanium dioxide having a mean primary particle size of 0.2 μm.

[0095] Deionised water (150g; 40 wt%) was added to a 250ml beaker and sheared using a Silverson high shear mixer. Titanium dioxide powder (53.29g; 14.21 wt%) was then added in portions over a period of four minutes with the shearing continuing. Then, alumina powder (53.29g; 14.21wt%) was added in portions over a period of four minutes with the shearing continuing. On completion of the addition, sodium silicate solution (118.43g; 31.58 wt%) was added with shearing for a further three minutes. The viscosity of the liquid was found to be about 10 centipoise when measured

at 20°C and a shear rate of $200s^{-1}$ using a Mettler Rheomat 180 Viscometer incorporating a double gap measuring geometry.

Step 3

Application of coating formulation

[0096] The coating formulation prepared in Step 2 was coated onto the aluminium sheet prepared in Step 1 using a rotating Meyer bar coater (designation K303) to give a 12 μm wet film thickness.

Step 4

Drying the formulation

[0097] The coated sheet prepared in Step 3 was placed in an oven at 130°C for 80 seconds. The plate was then removed from the oven and allowed to cool to ambient temperature.

Step 5

Post-drying treatment

[0098] The dried sheet prepared in Step 4 was immersed in aluminium sulphate (0.1M) for thirty seconds. The sheet was then spray rinsed for about twenty seconds using tap water and fan dried.

Step 6

Application of light sensitive coating

[0099] A printing plate was produced from the sheet prepared in Step 5 by coating, using a Meyer bar, a light sensitive material of the quinone diazide/novolak resin type at a dry coating weight of 2 g/m^2. The light sensitive material was dried at 130°C for 80 seconds.

[0100] The light-sensitive coating includes a blue colour change dye which is arranged to change from dark blue to turquoise green on exposure.

Comparative Example 1

[0101] This was a commercial positive plate sold under the Trade Mark HORSELL CAPRICORN by Horsell Anitec of Leeds, England. The plate comprises an electrograined and anodised substrate provided with a quinone diazide/novolak resin and a dye as described in Example 1, Step 6.

Assessment of substrates used in the preparation of the plates of Examples 1 and C1

Assessment 1 - Surface Roughness (Ra)

[0102] This was measured using a Talysurf Plus unit fitted with a 112/2564-430 head, supplied by Rank Taylor Hobson Inc of Leicester, U.K. For each example, the roughness was assessed along a trace length of 15mm with respective measurements being taken in the direction of the grain of the aluminium and perpendicular to the direction of the grain.

[0103] Results are provided in Table 1 wherein the Ra stated is an average of 204 runs.

TABLE 1

Example No.	Ra in μm in grain direction	Ra in μm perpendicular to grain direction
1	0.47	0.47
C1	0.62	0.63

Assessment 2 - Surface Skewness (Ssk)

[0104] The surface skewness (Ssk) can be used to describe the shape of the surface height distribution. For a Gaussian surface which has a symmetrical surface height distribution, the skewness is zero. For an asymmetric surface height distribution, the skewness may be negative if the distribution has a longer tail at its lower side of the mean plane, or positive if the distribution has a longer tail at the upper side of the mean plane.

[0105] A Rank Taylor Hobson Form Talysurf 3-D unit fitted with a stylus of radius 2 μm was used to map an area of 200 μm by 200 μm for each of the examples. Results are provided in Table 2.

TABLE 2

Measurement	Example 1	Example C1
Sa, μm (mean deviation from plane)	0.45	0.79
Sq, μm (root mean square deviation from plane)	0.58	1
Sp, μm (maximum distance above mean plane)	4.06	2.33
Sv, μm (maximum distance below mean plane)	1.34	4.91
Ssk (skewness)	1.08	-0.86

[0106] The positive value for the Ssk of Example 1 shows that the surface is peak dominated; the negative value for Example C1 shows that the surface is pit dominated.

Assessment 3 - Whiteness (L)

[0107] This was measured using a Minolta CR-300 processor unit fitted with a CR-331 head, supplied by Minolta U. K. Limited of Milton Keynes, England. The unit was initially calibrated using a white tile supplied (CR-A46). The instrument was configured in its Lab mode (i.e. CIE 1976 colour system used); used a D65 light source; a 2° observer angle; and it was arranged to produce a value which is an average of three measurements. Measurements were taken firstly with an orientation mark on the measuring head aligned with the direction of the grain of the aluminium and, secondly, with the mark perpendicular to the grain direction so as to give whiteness values in two directions. An average of about 34 readings was taken. Results are provided in Table 3.

TABLE 3

Example No.	L value in metal grain direction (mean, SD)	L value perpendicular to metal grain direction (mean, SD)
1	84.5, 0.14	84.39, 0.47
C1	78.54, 0.09	78.24, 0.06

Assessment 4 - Gloss

[0108] This was measured using a Minolta Multigloss 268 reflectometer supplied by Minolta U.K. Limited of Milton Keynes, England. The unit was calibrated using an internal standard which is related to a black glass standard with a defined index of refraction (usually 1.567) which equals 100 units.

[0109] With a measurement angle of 85° (i.e. the angle from the normal to the plane of interest) measurements were taken in the direction of and perpendicular to the grain as described in Assessment 3. An average value from 3 scans was noted. Results are provided in Table 4.

TABLE 4

Example No.	Gloss units in metal grain direction (mean, SD)	Gloss units perpendicular to metal grain direction (mean, SD)
1	10.15, 0.48	10.4, 0.96
C1	18.96, 0.15	22.01, 0.4

Assessment 5 - Scanning Electron Microscopy (SEM)

[0110] A sample of substrate prepared as described in Example 1, Step 4, was stuck onto aluminium pin stubs using a conductive paint (Electrodag - a colloidal silver suspension in iso-butyl methylketone). The sample was sputter-coated with platinum using a Fisons Instruments SEM coating system model SC510. The sputter coating was carried out in a low pressure argon plasma for 120 seconds using a plasma current of 20 mA at 900 volts. Microscopy was carried out using the secondary electron detector of a Hitachi S-4100 field emission scanning electron microscope. A condenser lens 8 was used with an accelerating voltage of 10 keV and a working distance of 5 mm. The emission current was 10 μA.

[0111] A micrograph was obtained using a magnification of x1000. A visual assessment of this micrograph shows that the surface morphology is defined by particulate material of two types:

spherical particles of size ~0.2 μm; and
angular particles of size ~3-4 μm.

[0112] It is also clear that the particles are held in a binder material.

Assessment 6 - Energy Dispersive x-ray Analysis (EDX)

[0113] A sample of substrate was prepared as described in Assessment 5 except that it was sputter coated with platinum for only 90 seconds.

[0114] A Hitachi Scientific Instruments S-4100 field emission scanning electron microscope was used with the following conditions: accelerating voltage 20 kV, condenser lens 8, extraction voltage 4.7 kV, emission current 20 μA, working distance 20 mm, beam monitor aperture 2, objective aperture 1 and magnification 1000x.

[0115] Analysis was carried out using an Oxford Instruments Link ISIS 200 EDX system, thermally cyclable SiLi ATW detector (1024 channels, 20 keV range) and software revision 1.04a. The detector was calibrated using a cobalt calibration standard.

[0116] The X-ray analysis was carried out using the following acquisition set-up: fast counting mode, process time 3, upper energy 30 keV, preset livetime 200, acquisition rate approximately 7000 counts per second operating with a 30% deadtime. Window integral measurements were made using the "quant" requirement function of the software.

[0117] EDX elemental measurements were undertaken for 6 different areas on the sample. The absorption peaks obtained in the EDX spectra were assessed to indicate the elements present and integrated to give an indication of the relative amounts of each of the elements.

[0118] The percentage of each element was calculated from: element integral/sum of integrals of all elements noted.

[0119] Results are provided in Table 5

TABLE 5

Energy band (KeV)	Element detected	Absorption Band	Mean percentage of
1.388 - 1.587	Aluminium	K alpha	51.5
1.648 - 1.847	Silicon	K alpha	14.2
4.387 - 4.648	Titanium	K alpha	22.7
4.787 - 5.068	Titanium	K beta	3.2
0.477 - 0.608	Oxygen	K alpha	8.43

Assessment 7 - Reflectance FT-IR Spectroscopy

[0120] A sample of the substrate of Example 1 of length 10 cm and width 3 cm was cut from a sheet prepared as described in Example 1, step 5 and subjected to reflectance FT-IR using a Perkin Elmer System 2000 FT-IR unit, obtained from Perkin Elmer Limited of England. The sample was mounted on a variable angle reflectance attachment 13969 supplied by Graseby Specac Limited of Kent, England. Scanning of the sample was along the metal grain direction and at a scan angle of 84°. A spectrum obtained is shown in figure 1. Peaks are noted at the following wavenumbers (cm^{-1}). The figures in brackets after each number represent the level of absorbence : 1619.54 (0.25), 1268.92 (0.30), 1239.08 (0.31), 1160.75 (0.25), 1037.66 (0.24), 996.63 (0.26), 944.41 (0.16), 873.54 (0.15), 634.82 (0.17), 549.03 (0.20) and 522.92 (0.20) and 399.83 (0.28).

Assessment 8 - UV-VIS Absorbence Spectrum

[0121] A UV-VIS absorbence spectrum was run on a sample of substrate prepared as described in Example 1, Step 5 using a Perkin Elmer Lambda 15 UV/VIS spectrometer, fitted with an integrating sphere attachment and being obtained from Bodenseewek Perkin-Elmer GmbH of Uberlingen, Germany. The scanning speed was 240nm/min, the slit width was 2nm and the reference sample was 1050 aluminium alloy.

[0122] The spectrum is shown in Figure 2 from which it can be seen that, as the radiation wavelength is lowered, absorbence increases rapidly from a value close to 0 at 390 nm to over 1 at 340 nm. Absorption is consistently high below 340 nm.

Assessment of plates prepared in Examples 1 and C1

Assessment 9 - Visual assessment of dot shapes

[0123] Plates of examples 1 and C1 were exposed on a Montakop 65 lightframe. Each plate was imaged using a Printstar 21 Step Stouffer Wedge available from Horsell Anitec and an UGRA Plate Control Wedge 1982 obtained from FOGRA of Munich, Germany. Each plate was given sufficient exposure to give a clear Step 3 on the image of the Stouffer wedge after development. The plates were developed at 20°C for 60 seconds using GREENSTAR (Trade Mark) developer, sold by Horsell Anitec.

[0124] SEMs of dots produced from 5% UGRA dot screen areas were taken and these are shown in figures 3 and 4 for plates of Examples 1 and C1 respectively. The difference in roundness of the dots is easily appreciated: the dot on the plate of Example 1 is substantially circular whereas that of Example C1 is highly irregular.

Assessment 10 - Mathematical roundness of dots

[0125] 5% UGRA dot screen areas of Examples 1 and C1, prepared as described in Assessment 9, were evaluated by capturing an image of 10 dots using a JVC KY-F55BE 3CCD colour video camera fitted to an Olympus BX60 optical microscope set up for dark field illumination and having an Olympus dark field lens (UMP lan fl; 20x/0.46 bd; ∞/O). The microscope and lens were obtained from Olympus Optical Company (UK) Limited of London, England. Computer generated masks were produced for image analysis and these are shown in figures 5 and 6 for respective examples 1 and C1 Image analysis was carried out using Image-Pro Plus Version 1.3 for Windows obtained from Media Cybernetics of Maryland, USA. Image resolution was found to be 1.32 pixels μm^{-1}. Each image was binarized to determine dot area (a) and dot perimeter (b) and the roundness determined by the formula.

$$\text{roundness} = b^2/4\pi a$$

Results are provided in Table 6.

TABLE 6

Example	Roundness	Population Standard Deviation
1	1.35	0.08
C1	1.99	0.20

[0126] The values of "a" for the Examples was found to be approximately equal.

Assessment 11 - Resolution

[0127] Resolution is a quality datum. It was assessed for the plates of Examples 1 and C1 as described under point 2 in Praxis Report 34 (June 1996) published by FOGRA Forschungsgesellschaft Druck e.V of Munich, Germany, except that, whereas the Report states that: "A microline segment is considered to be featured on the plate if more than half of the total line lengths can be seen", for the Assessment, a microline segment was only considered to be featured if greater than 90% of the total line length could be seen. The plates were processed as described in Assessment 9.

[0128] Figures 7 and 8 provide resolution graphs for plates of Examples 1 and C1 respectively from which it will be noted that the resolution of Example 1 is about 6 μm and that of Example C1 is about 8 μm.

Assessment 12 - Exposure latitude

[0129] The exposure latitude of plates of Examples 1 and C1, processed as described in Assessment 9, was assessed as described under point 7 in Praxis Report 34 referred to above, except that a microline segment was only considered to be featured if greater than 90% of the total line length can be seen as described in Assessment 11.

[0130] The exposure latitude of Example 1 was found to be 1.44; and that of Example C1 found to be 1.32.

Assessment 13 - Dot Range

[0131] This was assessed by exposing to Clear 3 on a Stouffer 21 step wedge and as described under point 6 in Praxis Report 34 referred to above on plates processed as described in Assessment 9.

[0132] The dot range of Example 1 was found to be 0.5 to 99.5%; and that of Example C1 found to be 1 to 99%.

Assessment 14 - Photo-coating Release

[0133] The plates were exposed at the lowest exposure (Stouffer Clear 0) and assessed after being processed as described in Assessment 9. The plate of Example 1 appeared clear of photocoat, whereas some photocoat was retained in the grain of the plate of Example C1.

Assessment 15 - Ink-water balance

[0134] Plates prepared as described in Example 1 and C1 were run, side-by-side, on a Heidelberg Speedmaster SM52 press with Z-roller fitted using Federal Tait Duo Laser Brilliance 80 gsm paper obtained from Rothera & Brereton of Leeds, England; Gibbon JCR Geneva Black Ink, obtained from Gibbon JCR Ltd of Leeds, England; and a fount comprising 2% Emerald fount and 10% isosol obtained from Horsell Graphic Industries Ltd of Leeds, England. The point at which the printed image/non-image boundary became blurred was measured. The point for the plate of Example 1 was within 3% damp of that of Example C1.

Assessment 16 - Run Length

[0135] After 500,000 impressions on the Heidelberg press referred to in Assessment 15, it was found that:

- solid areas continued to print as well as a 5% dot area imaged from a 60 lines cm^{-1} screen.
- the background continued to print clearly;
- there were no signs of areas of the plate (e.g. the hydrophilic layer) breaking up or falling off.

Assessment 17 - Plate Aesthetics

[0136] Visual assessment of the plates of Examples 1 and C1 before development showed that Example 1 had better colour contrast between the image and non-image areas than Example C1.

[0137] Following development, it was also noted that Example 1 had better colour contrast between the two areas compared to Example C1.

Assessment 18 - Developer Resistance

[0138] Samples exposed as described in Assessment 9 were developed in a Mercury 650 Processor using GOLDSTAR developer sold by Horsell Anitec for 20 seconds dwell time at 14°C at one extreme; and for 60 seconds dwell time at 35°C at the other extreme. A shift of 4 steps on the Ugra micron lines was seen for both Example 1 and Example C1. Nonetheless, the plate of Example 1 held onto the 15 μm lines better than that of Example C1. One concludes, therefore, that the plate of Example 1 has no problem compared to commercial plates as regards developer resistance.

Assessment 19 - Stochastic Screens

[0139] It was found that the plate of Example 1 reproduced a stochastic screen very satisfactorily. In the assessment, the lowest spot size of 16 μm diameter was held well at clear 3 Stouffer for Example 1, whereas this spot was virtually eliminated on the plate of Example C1.

EXAMPLE 2

[0140] The procedure of Example 1 was repeated, excepted that Melinex 539 (biaxial polyethylene terephthlate (PET) film provided with an anti-static coating (supplied by ICI Melinex of Wilton, England)) was used instead of aluminium. The majority of properties of the plate produced were found to be similar to those of Example 1.

EXAMPLE 3

[0141] The procedure of Example 1 was repeated, except that Simcote 400 (a paper obtained from Samuel Grant Ltd of England) was used instead of aluminium. The majority of properties of the plate produced were found to be similar to those of Example 1.

EXAMPLE 4

[0142] A Statistical Experimental Design (SED) was set up to assess the effects of varying certain parameters in the formulation of Example 1 Step 2. In particular, the following properties were assessed:

(a) The susceptibility of the image to rub off - this was assessed by applying 5ml of TONE UP (a proprietary plate cleaner sold by Horsell Anitec) to a 5 $\times$ 5 cm area of the plate of Example 1, followed by using a wad of damp tightly rolled cotton wool to wipe across the image layer using a heavy downward pressure for a total of 50 passes. The plate was rinsed in tap water and the rubbed area was examined for wear. A scale was set wherein complete removal of the image layer was given a value of 100 and no removal was given a value of 0.

(b) The susceptibility of the non-image area to staining by the dye in the photocoat - this was assessed using the Minolta CR-300 processor unit referred to in Assessment 3 to assess the extent of any blue colour in developed non-image areas.

(c) The susceptibility of the non-image area to ink reception - this was assessed on a developed non-image area coated with a gum and rinsed in tap water, followed by removal of excess water using a rubber blade. A 2 ml drop of ink was applied to a wad of cotton wool and this was wiped across the non-image area to allow the ink to adhere to the non-image area if it could. The plate was then rinsed in tap water to remove any loosely bound ink and the plate assessed.

[0143] With regard to (a), it was found that the susceptibility of the area to rub off decreased with increasing the powder (i.e. alumina and titania) to silicate ratio. Additionally, increasing the alumina content of the powder was found to decrease rub off.

[0144] with regard to (b), it was found that the susceptibility of the non-image area to staining increased as the ratio of powder to silicate was increased.

[0145] With regard to (c), it was found that a reduction in the powder to silicate ratio reduced ink reception.

Claims

1. A printing member comprising:

a substrate which comprises a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material;

wherein said printing member carries information in a stochastic form.

2. A member according to Claim 1, wherein the Ra is at least 0.1 μm and less than 0.6 μm.

3. A member according to any preceding claim, wherein an elemental analysis of the hydrophilic layer shows that it includes the elements silicon and oxygen.

4. A member according to any preceding claim, wherein the ratio of Ti: Al in the hydrophilic layer is in the range 0.5 to 2.

5. A member according to any preceding claim, wherein a reflectance FT-IR spectrum of the hydrophilic layer has at least one peak in one of the following ranges: 1200 to 1300 cm^{-1}, 1100 to 1200 cm^{-1} and 900 to 1000 cm^{-1}.

6. A member according to any preceding claim, wherein a UV-VIS absorbence spectrum shows that, on decreasing the wavelength, absorbence starts to increase rapidly at a wavelength in the range 380 to 430 nm and reaches a value of greater than 1.

7. A member according to any preceding claim, wherein said hydrophilic layer includes a material having Si-O bonds.

8. A member according to any preceding claim, wherein said binder material is derived or derivable from a silicate material.

9. A member according to any preceding claim, wherein said particulate material comprises a first particulate material having a mean particle size of at least 0.1 μm and less than 200 μm and a second particulate material having a mean particle size of at least 0.001 μm and less than 200 μm.

10. A member according to any preceding claim, having a whiteness (L) value of at least 75 and less than 100.

11. A member according to any preceding claim, having a gloss value of at least 5 and less than 20.

12. A method of stochastic or colour printing, the method using a printing member which includes a substrate comprising a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material.

13. Use of a printing member comprising a substrate which comprises a support and a hydrophilic layer having a surface roughness (Ra) in the range 0.1 um to 2 um, said hydrophilic layer comprising a particulate material and a binder material for the particulate material, in stochastic printing or colour printing.

Patentansprüche

1. Druckelement, umfassend:

   ein Substrat, welches einen Träger und eine hydrophile Schicht mit einer Oberflächenrauheit (Ra) im Bereich von 0,1 μm bis 2 μm umfasst, wobei die hydrophile Schicht ein teilchenförmiges Material und ein Bindemittelmaterial für das teilchenförmige Material umfasst; wobei das Druckelement Information in einer stochastischen Form trägt.

2. Element gemäß Anspruch 1, wobei der Ra-Wert mindestens 0,1 μm und weniger als 0,6 μm beträgt.

3. Element gemäß einem der vorstehenden Ansprüche, wobei eine Elementaranalyse der hydrophilen Schicht zeigt, dass sie die Elemente Silicium und Sauerstoff enthält.

4. Element gemäß einem der vorstehenden Ansprüche, wobei das Verhältnis von Ti: Al in der hydrophilen Schicht im Bereich von 0,5 bis 2 ist.

5. Element gemäß einem der vorstehenden Ansprüche, wobei ein Reflexions-FT-IR-Spektrum der hydrophilen Schicht mindestens ein Signal in einem der nachstehenden Bereiche aufweist: 1200 bis 1300 cm^{-1}, 1100 bis 1200 cm^{-1} und 900 bis 1000 cm^{-1}.

6. Element gemäß einem der vorstehenden Ansprüche, wobei ein UV/VIS-Absorptionsspektrum zeigt, dass mit Abnahme der Wellenlänge die Absorption bei einer Wellenlänge im Bereich von 380 bis 430 nm schnell anzusteigen beginnt und einen Wert größer als 1 erreicht.

7. Element gemäß einem der vorstehenden Ansprüche, wobei die hydrophile Schicht ein Si-O-Bindungen aufweisendes Material enthält.

8. Element gemäß einem der vorstehenden Ansprüche, wobei das Bindemittelmaterial von einem Silicatmaterial

abstammt oder ableitbar ist.

9. Element gemäß einem der vorstehenden Ansprüche, wobei das teilchenförmige Material ein erstes teilchenförmiges Material, welches eine mittlere Teilchengröße von mindestens 0,1 μm und weniger als 200 μm aufweist, und ein zweites teilchenförmiges Material, welches eine mittlere Teilchengröße von mindestens 0,001 μm und weniger als 200 μm aufweist, umfasst.

10. Element gemäß einem der vorstehenden Ansprüche, welches einen Weißgradswert (L) von mindestens 75 und weniger als 100 aufweist.

11. Element gemäß einem der vorstehenden Ansprüche, welches einen Glanzwert von mindestens 5 und weniger als 20 aufweist.

12. Verfahren eines stochastischen Drucks oder Farbdrucks, wobei das Verfahren ein Druckelement verwendet, welches ein Substrat, umfassend einen Träger und eine hydrophile Schicht mit einer Oberflächenrauheit (Ra) im Bereich von 0,1 μm bis 2 μm, enthält, wobei die hydrophile Schicht ein teilchenförmiges Material und ein Bindemittelmaterial für das teilchenförmige Material umfasst.

13. Verwendung eines Druckelements, umfassend ein Substrat, welches einen Träger und eine hydrophile Schicht mit einer Oberflächenrauheit (Ra) im Bereich von 0,1 μm bis 2 μm umfasst, wobei die hydrophile Schicht ein teilchenförmiges Material und ein Bindemittelmaterial für das teilchenförmige Material umfasst, für stochastischen Druck oder Farbdruck.

Revendications

1. Procédé pour rendre non imprimable une zone imprimable choisie d'un élément d'impression d'un type comprenant un support; une couche hydrophile qui contient un matériau liant dans lequel est placé un matériau particulaire, dans laquelle au moins 90% en poids dudit matériau liant est constitué d'un matériau polymère comportant des liaisons Si-O; et une couche d'image, le procédé comprenant la mise en contact de ladite zone avec un dispositif (appelé dans la suite "ledit dispositif hydrophilisant") qui rend ladite zone non imprimable à une vitesse plus grande que celle à laquelle il peut éliminer ladite couche hydrophile.

2. Procédé selon la revendication 1, dans lequel ladite couche hydrophile est éliminée par ledit moyen hydrophilisant à une vitesse inférieure à 0,15 $\mu m.s^{-1}$.

3. Procédé selon la revendication 1 ou la revendication 2, dans lequel ladite zone imprimable est rendue non imprimable en l'espace de trois minutes.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel la vitesse pour rendre non imprimable ladite zone imprimable est au moins 5 fois plus grande que la vitesse d'élimination de ladite couche hydrophile.

5. Procédé selon l'une quelconque des revendications précédentes, dans lequel le contact avec ledit dispositif hydrophilisant rend non imprimable ladite zone imprimable en éliminant ladite zone à une vitesse supérieure à 0,005 $g.m^{-2}.s^{-1}$.

6. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif hydrophilisant est choisi parmi un ou plusieurs des systèmes suivants: acides, bases et formulations oxydantes.

7. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif hydrophilisant est choisi parmi les acides minéraux forts, les acides minéraux faibles, les acides organiques, les hydroxydes, les silicates, les nitrites, les nitrates, les peracides, les perhalogénates, le peroxyde d'hydrogène et les agents oxydants à base de métaux de transition.

8. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif hydrophilisant comporte un dispositif pour ramollir ladite couche hydrophile.

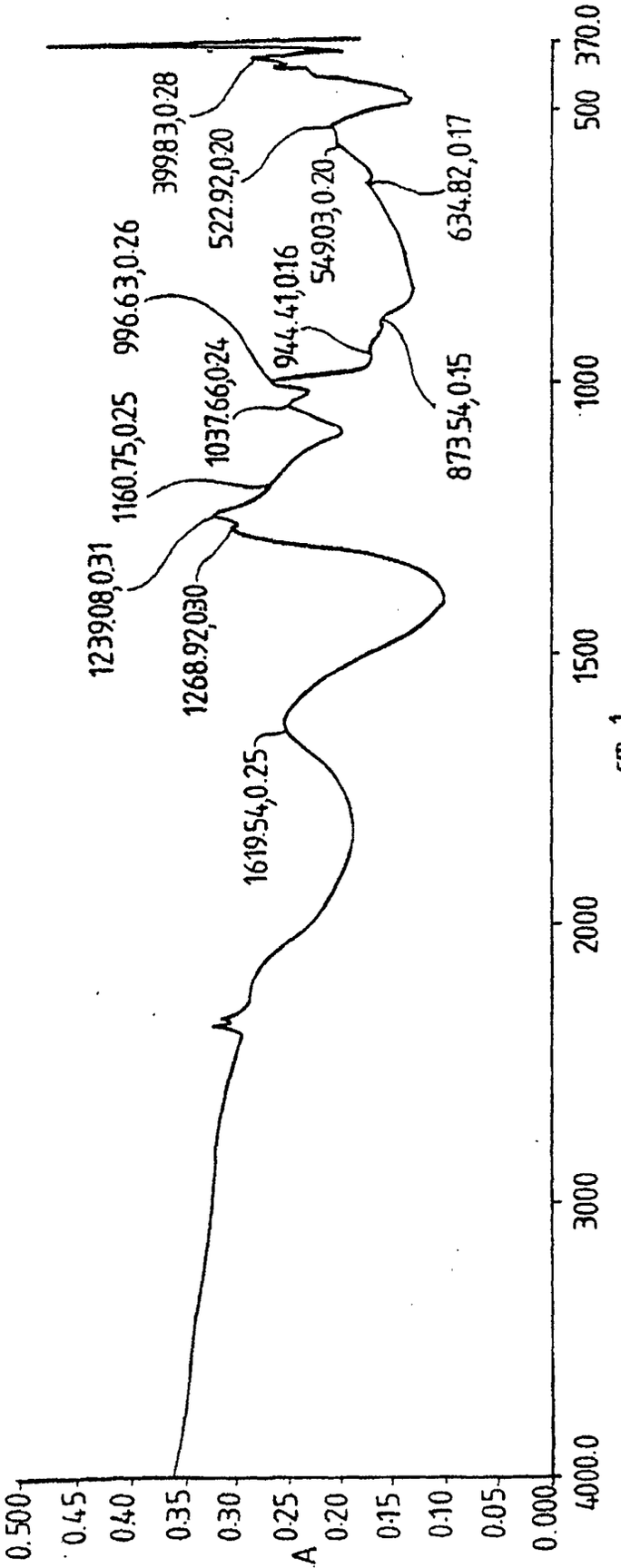
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit dispositif hydrophilisant comporte un ou plusieurs solvants.

10. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel le contact avec ledit dispositif hydrophilisant rend ladite zone imprimable non imprimable en recouvrant ladite zone.

11. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit matériau liant est essentiellement constitué d'un matériau polymère comportant des liaisons Si-O.

12. Procédé selon l'une quelconque des revendications précédentes, dans lequel ledit matériau liant est obtenu à partir d'une solution de silicate.

13. Procédé selon la revendication 12, dans lequel ledit matériau particulaire comprend un premier matériau particulaire ayant une granulométrie moyenne d'au moins 0,1 μm et de moins de 200 μm et un second matériau particulaire ayant une granulométrie moyenne d'au moins 0,001 μm et de moins de 200 μm.



Example 1, measured at 84 degrees & 50 scans.

Fig.1.

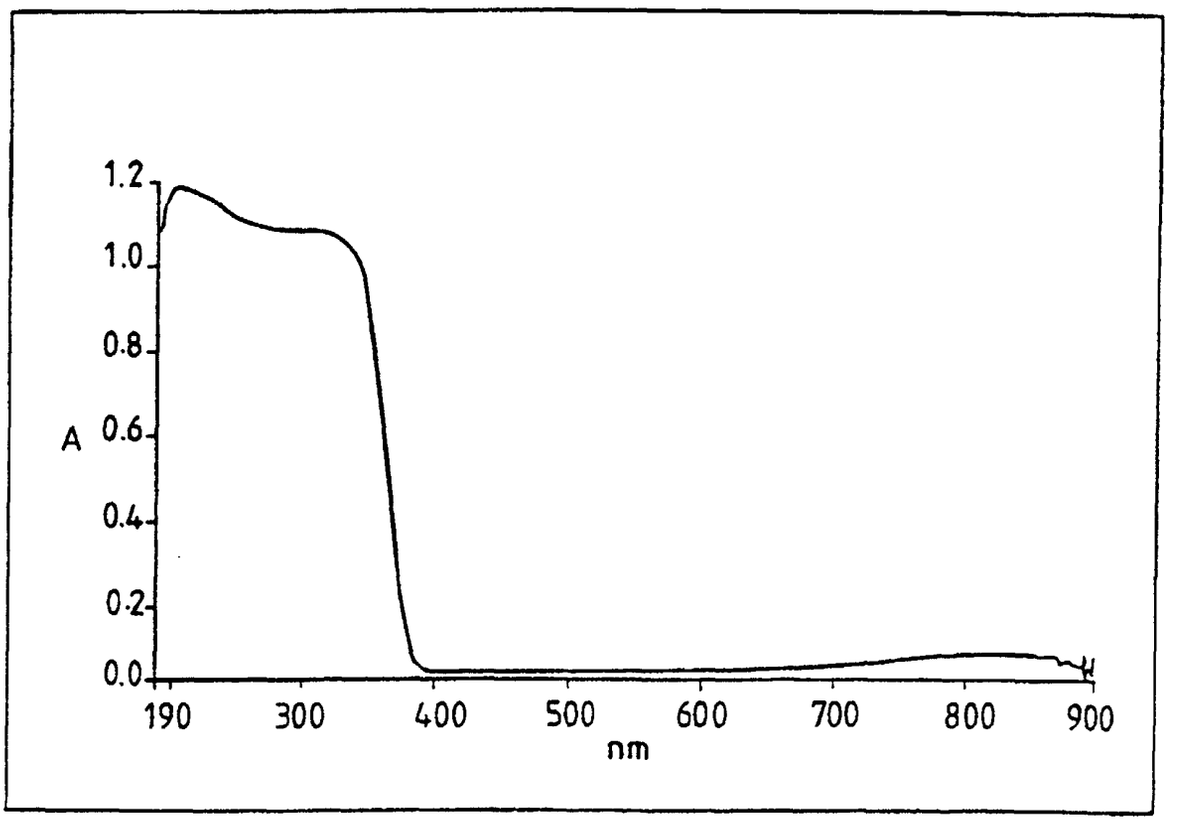


Fig.2.

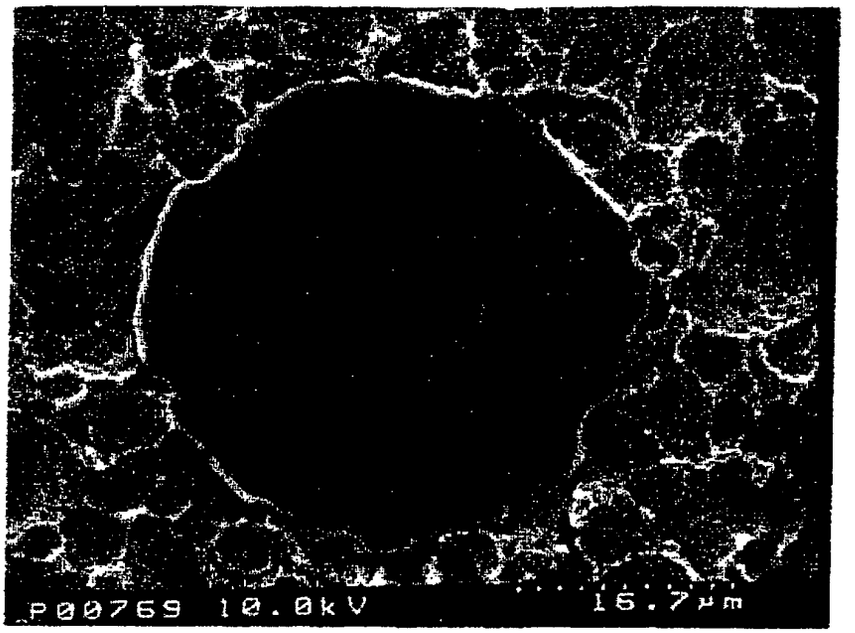


Fig.4.

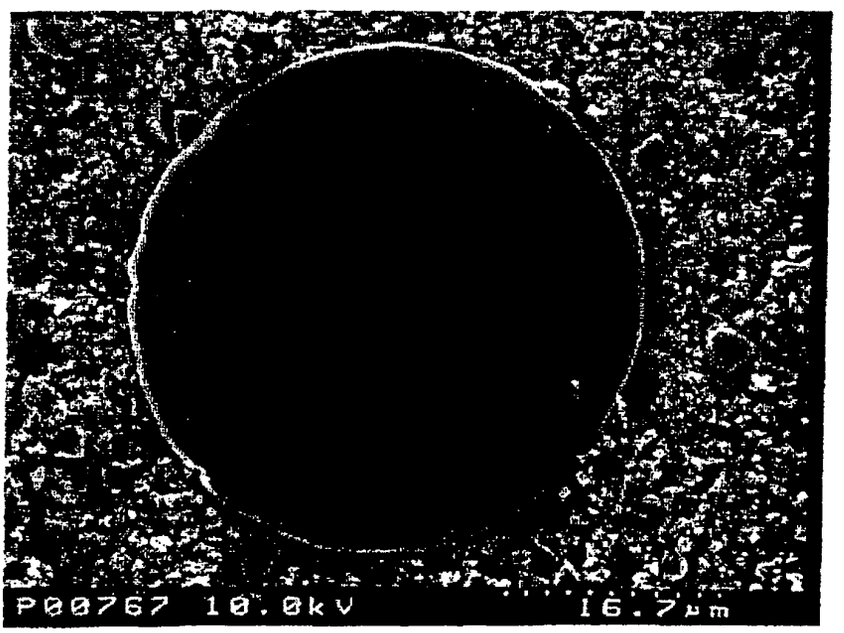


Fig.3.

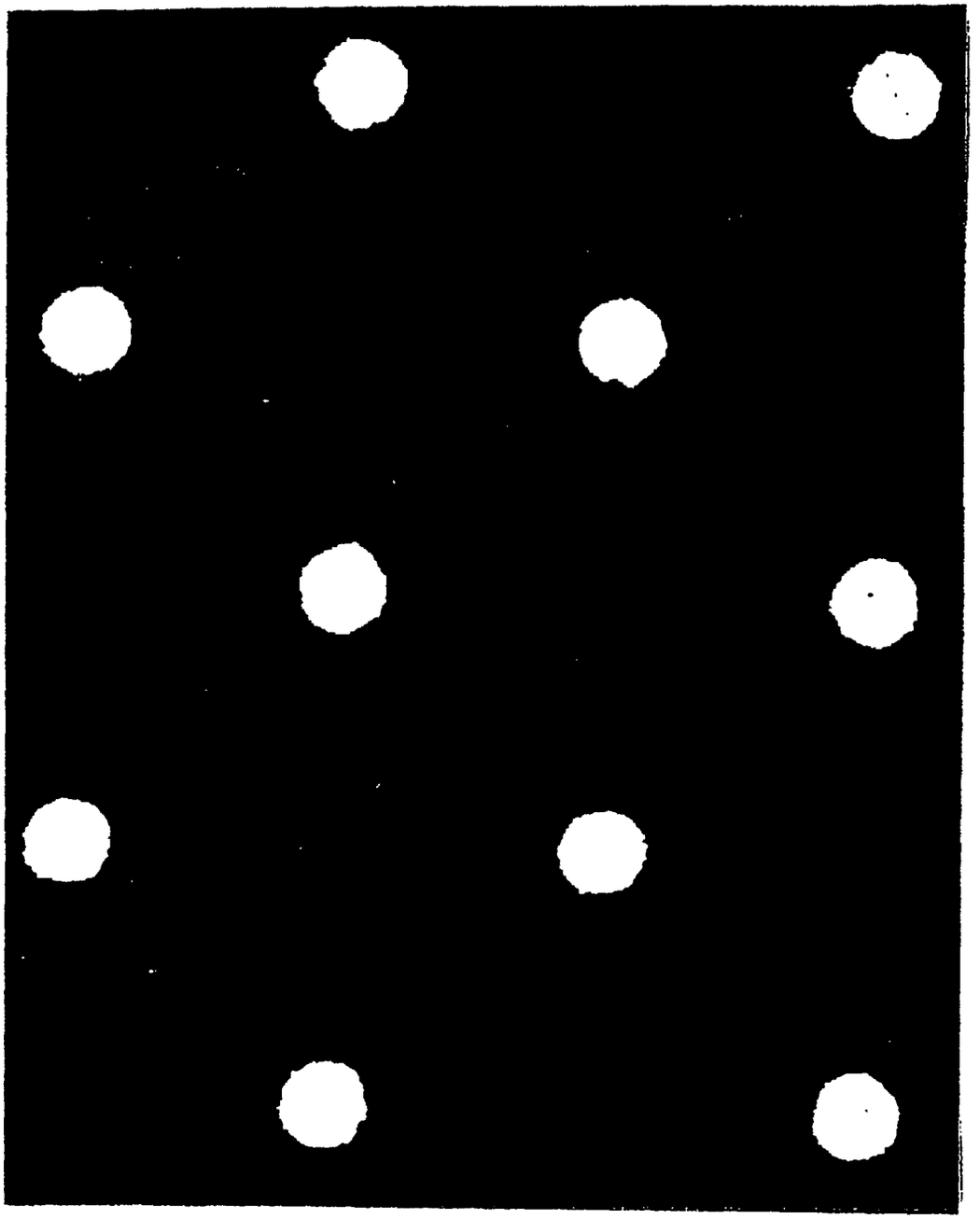


Fig.5.

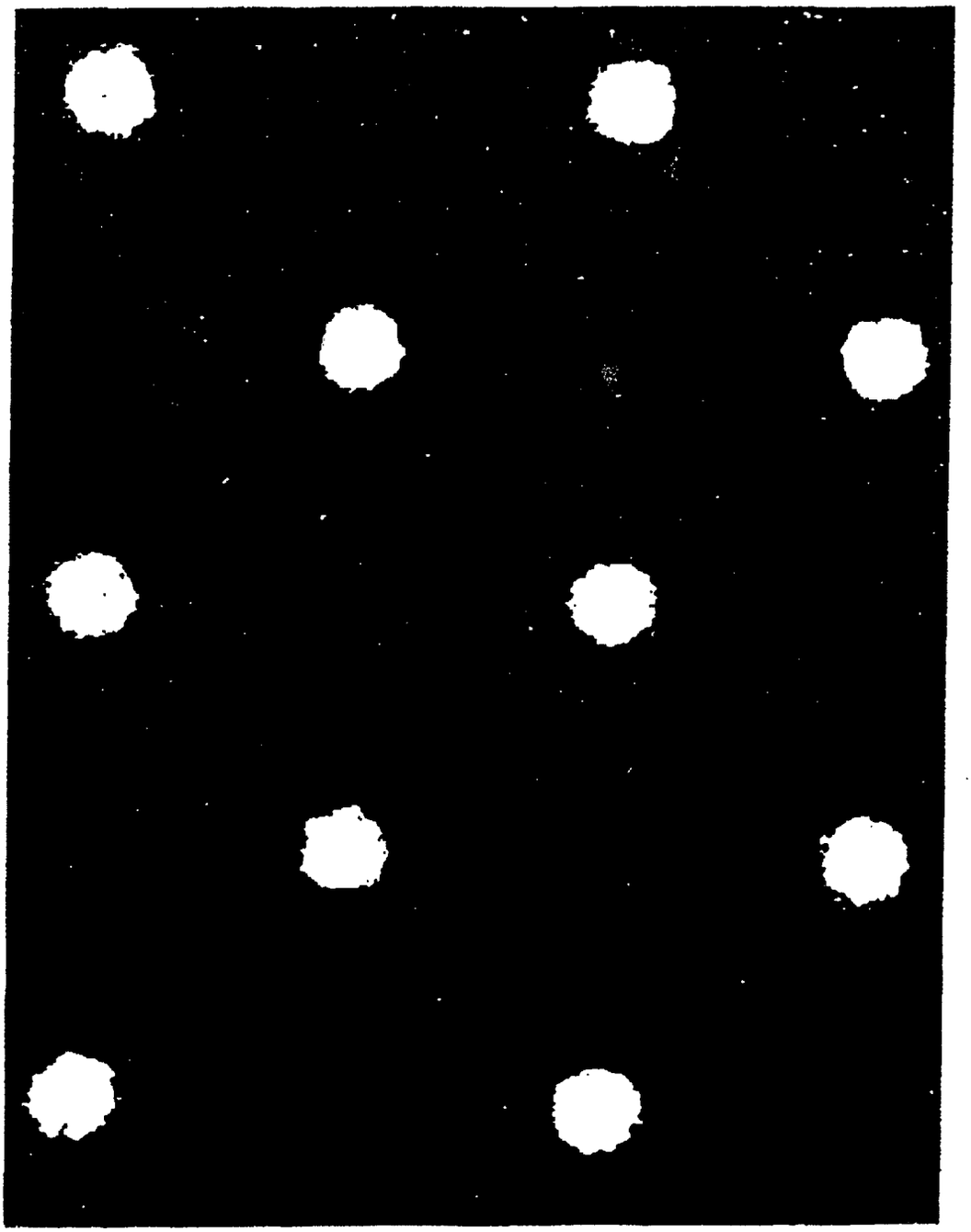


Fig.6.

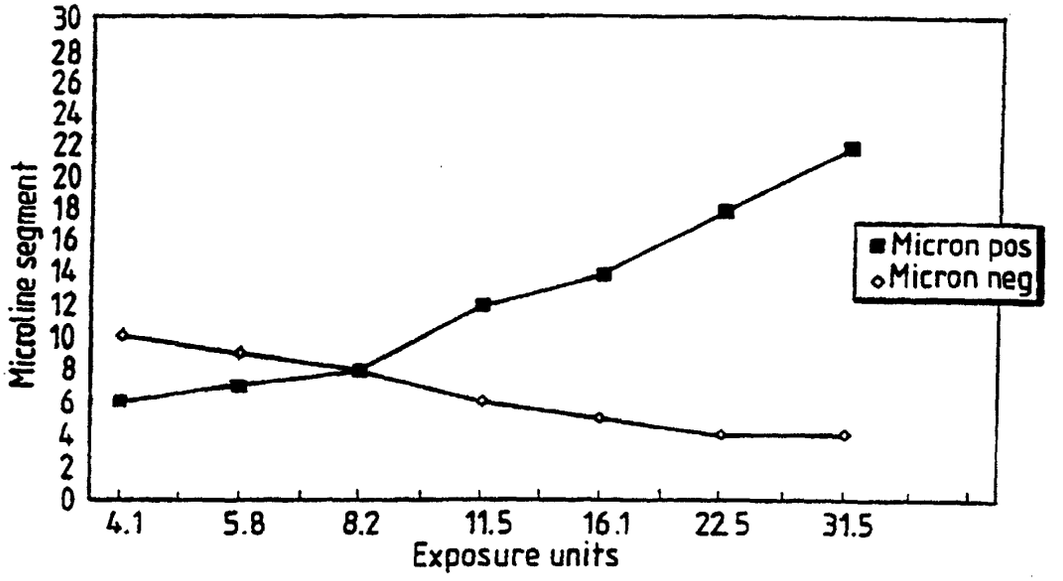

Microline segment
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
4.1
5.8
8.2
11.5
16.1
22.5
31.5
Exposure units
Micron pos
Micron neg

Fig.8.

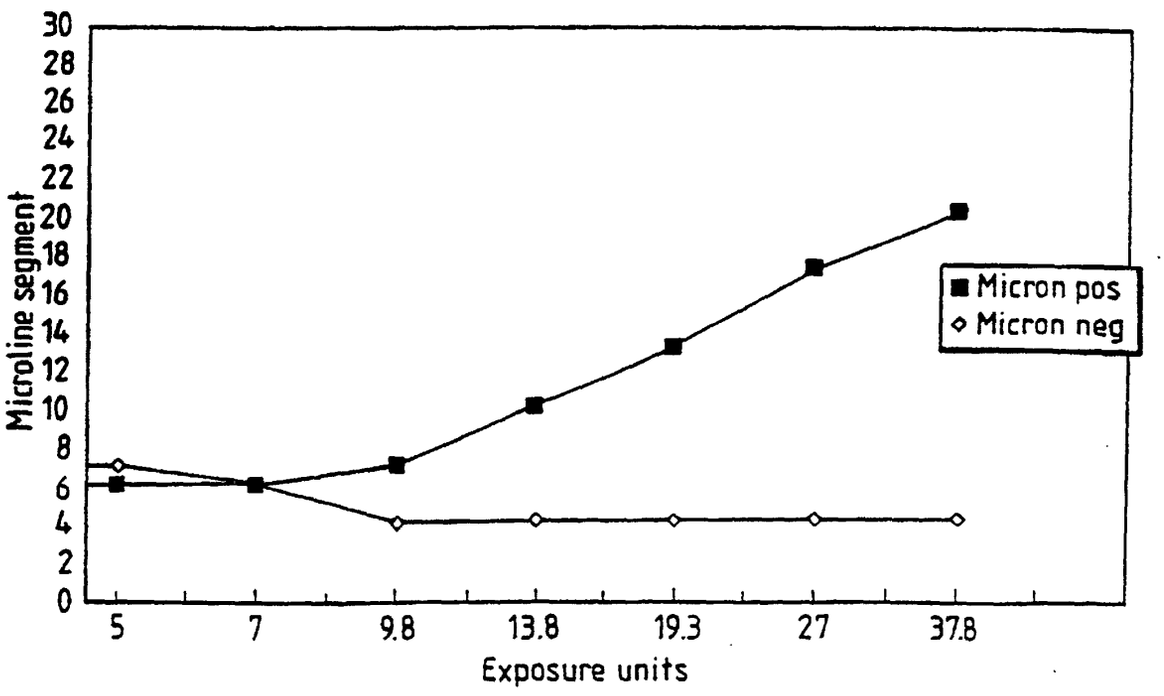

Microline segment
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
5
7
9.8
13.8
19.3
27
37.8
Exposure units
Micron pos
Micron neg

Fig.7.