

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 June 2002 (06.06.2002)

PCT

(10) International Publication Number
WO 02/43965 A2

(51) International Patent Classification⁷: **B41M 5/00**

(21) International Application Number: PCT/US01/44524

(22) International Filing Date:
29 November 2001 (29.11.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
09/726,196 29 November 2000 (29.11.2000) US

(71) Applicant (for all designated States except US): **AVERY DENNISON CORPORATION** [US/US]; 150 North Orange Grove Boulevard, Pasadena, CA 91103 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SHIH, Frank, Yen-Jer** [US/US]; 911 Palo Alto Drive, Arcadia, CA 91007 (US). **LAD, Dalubhai, M.** [US/US]; 13919 Ravenwood Drive, Chino Hills, CA 91709 (US). **HUANG, Zhisong** [CN/US]; 2243 Paseo Jacinta, San Dimas, CA 91773 (US).

(74) Agent: **CARPENTER, John, D.**; Christie, Parker & Hale, LLP, Post Office Box 7068, Pasadena, CA 91109-7068 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

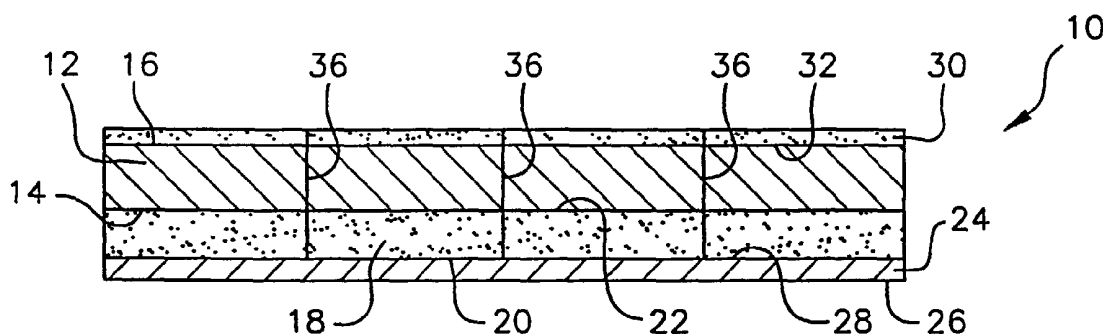
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **INK JET-PRINTABLE MEDIA**



(57) Abstract: Coatable compositions and ink-receptive constructions made therewith are provided. The compositions comprises a mixture of polyvinyl pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone. The compositions are particularly suited as ink-receptive topcoats for facestocks and label stocks used in ink jet and other printers.

WO 02/43965 A2

INK JET-PRINTABLE MEDIA

FIELD OF THE INVENTION

The present invention relates to compositions for enhancing the ink-receptiveness of printable materials, and coated substrates and constructions made with such compositions.

BACKGROUND OF THE INVENTION

Consumer products labeled with price, product, and other information are ubiquitous in modern society. Printable labels are also used on the sides of trucks, on billboards and other signage, and in the home and office. New software and printer designs have enabled a tremendous variety of fonts, designs, and even photographs to be printed with computer printers, and demand has grown for high quality films, papers, and labels that can be used with such printers.

Both opaque and transparent sheets, labels, and other constructions are known. Transparent labels have been made with a clear film facestock, a pressure-sensitive adhesive laminated thereto, and a protective release liner, such as a siliconized film or paper backing. In general, transparent plastic film facestocks are not particularly ink-receptive and do not provide the high print quality demanded by consumers.

Efforts to product high quality transparent (as well as opaque) ink-receptive sheets, labels, and other products, however, have been made. One such effort is described in U.S. Patent No. 5,407,718 (Popat et al.), the entire contents of which is incorporated by reference herein. The '718 patent describes transparent paper label sheets that can be printed with a high quality image in ink jet, xerographic, and other printers. Despite the commercial success of the label sheets described in the '718 patent, a continuing need exists for improved ink-receptive compositions and coated products.

SUMMARY OF THE INVENTION

In accordance with the present invention, there are provided coatable compositions and ink-receptive coated products made therewith. In one embodiment, a coatable composition comprises a mixture of polyvinyl pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone, with the components preferably being dissolved or dispersed in a solvent, e.g., an alcohol, or a mixture of alcohol and water. It is also preferred to include in the composition a solvent, such as alcohol or a mixture of alcohol and water. In water-free systems, a small amount of organic acid is preferably added to improve pot life. In mixed alcohol/water-based systems, it is preferred to include a small amount of polyethylene imine, which acts as a mordant and improves the ink-receptivity of the composition.

In another embodiment of the invention, ink-receptive constructions are prepared by coating the improved composition onto a facestock or label stock and drying the coated construction. The products exhibit good ink-receptivity and are particularly suited for use in ink jet printers. Transparent, as well as opaque, label constructions, coated papers, films, signage, and other products are made using the improved ink-receptive compositions. A particularly preferred transparent label construction has a polyester film facestock, one surface of which is coated with a pressure-sensitive adhesive layer, which is protected until use by a release liner. An ink-receptive topcoat is applied to the outer surface of the polyester film. Labels can be die-cut into the construction, which is designed to perform well in ink jet and other printers.

BRIEF DESCRIPTION OF THE DRAWINGS

The Figure is a schematic side view of a label sheet according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

In a first aspect of the invention, a coatable composition is provided and comprises a mixture of polyvinyl

pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone. Preferably, the components are dissolved or dispersed in a solvent. Other components can be added to improve pot life, coatability, and other properties as described below.

In general, the compositions contain, on a parts-by-weight basis, from about 2 to 30% (preferably about 5 to 20%) polyvinyl pyrrolidone, about 2 to 10% (preferably about 3 to 7%) silica, and about 0.25 to 1% chromium complex. Where a solvent is present, it comprises from about 50 to 95% (preferably about 75 to 95%) of the composition.

It has been found that the molecular weight of the polyvinyl pyrrolidone (PVP) can affect the viscosity and solids content of the composition, which in turn affects the coating speed and cost of making ink-receptive products coated with the composition. In general, compositions prepared in accordance with the present invention utilize PVP having a K value of from about 60 to 100 and a weight average molecular weight (M_w) of from about 300,000 to 2,500,000. More preferably, the PVP has a K value of from about 75 to 90 and a M_w of from about 750,000 to 1,000,000. PVP is available from a number of companies, including ISP Technologies, Inc. and BASF.

The silica component imparts ink absorptivity and ink permanency to the coated construction. Several types of silica are known, with varying pore size (and hence, varying ink-absorptivity), including fumed silica, precipitated silica, and silica gel. Silica gel has the highest pore volume and is preferred. A nonlimiting example is Gasil HP-39, from Crosfield Company (Joliet, IL). In clear label applications, if too much silica is present, or the silica particle size is too great, or the coat weight of the composition is too high, the resulting coated label stock will not exhibit the desired "touch clear" property (the ability to appear clear when pressed against a substrate, such as an envelope).

The chromium complex present in the composition is capable of crosslinking polyvinyl pyrrolidone. A preferred,

nonlimiting example of such a complex is Quilon C, made by E.I. du Pont de Nemours and Company. Other grades of Quilon[®] complexes are also available. Du Pont product literature describes Quilon[®] as "a solution, largely in isopropanol, of a dark green, chemically reactive complex in which a C₁₄-C₁₈ fatty acid is coordinated with trivalent chromium." Quilon C has CAS Registry No. 65229-24-5. It has been described as pentahydroxy(tetradecanoato) dichromium.

A number of organic and mixed organic/aqueous solvents can be used to prepare coatable compositions according to the present invention. In one embodiment, the solvent is an alcohol. In another embodiment, the solvent is a mixture of alcohol and water. Alternatively, other organic solvents may be used. Although alcoholic compositions can be prepared using methanol or ethanol, in commercial-scale production it is preferred to use an alcohol with a high boiling point, for example, n-butanol (b.p. = 117.7°C). In those embodiments where a mixture of alcohol and water is employed as the solvent, the preferred alcohol is isopropanol, which is much more miscible with water than is n-butanol.

To improve the pot life of water-free compositions, it is preferred to add an organic acid, for example, acetic acid, prior to coating. Although not bound by theory, it is believed that the acid retards the chromium complex-catalyzed crosslinking of PVP at room temperature, thus improving the pot life of the composition and facilitating coating in conventional coaters. In organic solvent-based compositions lacking an acid, the viscosity of the composition may build undesirably with time, making it extremely difficult to coat the composition. If included, the organic acid is present in a positive amount up to about 5%, preferably from about 0.1 to 5%, based on the weight of all components.

The ink-receptivity of mixed alcohol/water-based systems can be improved by the addition of a mordant, such as polyethylene imine (PEI). For example, a positive amount up to about 25%, more preferably from about 1 to 10%, of an aqueous polyethylene imine solution is included in some

embodiments of the invention. It has been found that adding neat PEI to the composition can cause gelling. This is avoided by pre-diluting the PEI with water.

The coatable compositions are prepared by mixing polyvinyl pyrrolidone, silica, chromium complex and other components (e.g., solvent, organic acid, PEI, etc.) using mixing techniques and apparatus well known in the art. The chromium complex, as well as any organic acid, is preferably added to the composition just prior to coating. Once the components are mixed, the composition can be stored with continuous mixing for at least one month without chromium complex, and up to 8-10 hours with the complex.

The composition can be coated on a facestock or label stock, using conventional coating techniques. Nonlimiting examples of such techniques include slot die, air knife, brush, curtain, extrusion, blade, floating knife, gravure, kiss roll, knife-over-blanket, knife-over-roll, offset gravure, reverse roll, reverse-smoothing roll, rod, and squeeze roll coating. The composition can also be applied to paper substrates in a size press, during paper manufacture.

For label products, the composition can be applied using any conventional technique or process, including without limitation, coating "on-press" during the converting process (e.g., in concert with the processes of die-cutting, matrix stripping, etc.), coating "off-press" using a separate coater, and other application methods known in the art. After being coated or otherwise applied to a facestock or label stock, the coated construction is dried at room temperature or in an oven to remove most of the solvent and other volatile components.

The choice of which coating technique to use for a given application depends on several factors, including the cost and availability of equipment, the facestock or labelstock to be coated, the viscosity and solids content of the composition, the choice of solvent used, the desired coat weight, etc. For some applications, a solids content as high as 40% is acceptable, with 15 to 20% being somewhat more preferred. Typical (but nonlimiting) values of the viscosity of the

composition prior to coating range from about 500 to 1,000 centipoise. In general, coat weights of from about 2-30g/m², more preferably about 5-15g/m², (measured on a dry basis) are preferred. Coated clear film facestocks (e.g., polyester) are advantageously prepared with composition coat weights of from about 5 to 15g/m² (dry weight).

Both "wide format" and "narrow format" ink-receptive products are encompassed by the invention. Wide format products are generally manufactured as wide rolls (24 or more inches wide), and are roll-fed into large printers for imaging. They are typically employed in commercial settings and are used to make, e.g., movie theater posters, outdoor signage, large advertisements, fleet marking (i.e., truck panel advertising), and other products. Narrow format products are generally manufactured as narrow rolls or individual sheets, and can be roll-fed or sheet-fed into printers for imaging. They are typically used in the office or home, and include, without limitation, computer printer paper, labels, transparencies, and similar products.

Coatable substrates useful in the practice of the present invention include plastic film, especially transparent film, as well as paper, cardboard, corrugated board, metal film or foil, fabric, and other facestocks and label stocks traditionally used for ink printing application, particularly ink jet printing. Self-wound materials and other linerless materials are also suitable substrates. A nonlimiting example includes self-wound tapes.

Nonlimiting examples of plastic facestocks suitable for use with the present invention include polyester, polystyrene, polyvinyl chloride, nylon, and polyolefin (for example, polyethylene) films, as well as polymer blends. The films may be cast, extruded, or coextruded. In some embodiments, film facestocks may be pre-treated with a primer to improve coating anchorage to the film. A nonlimiting example is Adcote 69X 100 - from Morton International (now a subsidiary of Rohm Haas) - in toluene). Primer coated PET facestock is also available from SKC America, Inc. (Covington, GA).

Nonlimiting examples of paper facestocks include offset, bond, text, cover, index, lightweight printing paper, litho paper, and sulfite paper.

Label stocks include, without limitation, a variety of printable label constructions or assemblies well known in the art, each typically comprising a label facestock (sheet or roll) having at least one inner and at least one outer surface, a pressure-sensitive adhesive (PSA) adhered to at least one inner surface of the label facestock, and a removable release liner protecting the PSA until use, the entire assembly forming a sandwich-like construction.

Figure 1 is a schematic illustration of a sheet of ink-receptive labels prepared in accordance with one embodiment of the invention. The construction 10 has a sandwich structure, in which a facestock 12, a pressure-sensitive adhesive (PSA) layer 18, a release liner 24, and an ink-receptive topcoat 30 are coated on or laminated to each other in the order shown.

Thus, the facestock 12 has first and second surfaces 14 and 16; the PSA layer 18 has first and second surfaces 20 and 22; the release liner 24 has first and second surfaces 26 and 28, and the ink-receptive top coat has first and second surfaces 32 and 34. It will be appreciated that the relative thickness (ES) of the layers is variable and is not drawn to scale in the figure.

A plurality of die cuts 36 extend through the ink-receptive top coat, the facestock, and the pressure-sensitive adhesive, but not the release liner. The die cuts facilitate detachment and removal of individual labels from the label sheet.

A construction as shown in Figure 1 is prepared in a conventional manner. Thus, a PSA is coated on a siliconized release liner; an ink-receptive coating is applied to one side of a facestock; and the two subassemblies are laminated to each other. Alternatively, a PSA is coated on one side of a facestock and laminated to a protective release liner. An ink-receptive coating is then applied to the other side of the facestock. The layers of the construction can also be applied

in other ways and in alternative sequences known to those skilled in the art.

It will be appreciated that the construction shown in the figure is but a single embodiment of an ink-receptive label construction prepared in accordance with the invention. There are numerous other embodiments and variations that will be appreciated by one skilled in the art upon reading the present description. Ink-receptive papers, films, and other products can be made by coating or otherwise applying an ink-receptive composition to a substrate.

The following are nonlimiting examples of the invention.

Control 1 and Examples 1-3

Four different ink-receptive coatable compositions were prepared by blending the components listed in Table 1 in a low shear blender for 15 minutes. Control 1 contains no Quilon C and no acetic acid. Example 1 contains Quilon C. Example 2 is the same as Example 1, but additionally contains acetic acid. Example 3 contains Quilon C, no acetic acid, and a solvent consisting of a mixture of isopropyl alcohol, water, and polyethylene imine.

Table 1 - Control 1 and Examples 1-3

	Control 1	Ex. 1	Ex. 2	Ex. 3
Component	Parts-by-weight (wet weight)			
n-butanol	90	89.8	88.8	
isopropyl alcohol				79
water				3.97
PVP ¹	7	7	7	8.23
silica gel ²	3	3	3	3.6
chromium complex ³		0.2	0.2	0.24
acetic acid			1	
polyethylene imine ⁴				5
total	100	100	100	100.04

¹ From ISP, Inc.; K Value:90

² Gasil HP-39

³ Quilon C

⁴ 20% by weight in water

Clear Ink Jet Labels

To evaluate the ink-receptivity of transparent labels top-coated with compositions prepared in accordance with the present invention, a series of label constructions were prepared by coating each of Control 1 and Examples 1-3 on one side of a 1.5 mil thick, primer-treated polyester film from SKC America; coating the other side with an acrylic PSA; drying the coated subassembly; and laminating the construction to a siliconized release liner. In each case, the ink-receptive composition was coated to a dry coat weight of about 8g/m². For comparison, a commercially available clear ink jet label from Avery Dennison Corporation (Control 2) was also evaluated. The samples were imaged in four different printers: HP 694C, HP 890C, Epson Stylus 600, and Canon BJC-4300. Printer performance tests were conducted at 72°F and 5% relative humidity. Each printer was set in normal printing mode.

To evaluate printing performance, each of Controls 1-3 were examined for eleven ink jet image properties. Optical density measurements were taken using a reflective densitometer (e.g., an X-rite densitometer) with an aperture of 4 mm.

The following properties were evaluated:

Black dry time: A measure of the rate of absorption of black ink into a sheet of the printable media.

Black text quality: A visual assessment of black ink printed letters and their acceptability. Wicking, feathering, dot gain, and other defects take away from text quality.

Black fill: Refers to cascading and mottling effects with black ink.

Color dry time: A measure of the rate of colored ink absorption into a sheet of printable media.

Color text quality: A visual assessment of colored ink printed letters, and their acceptability. Wicking, feathering, dot gain and other defects take away from text quality.

Color fill: Refers the cascading and mottling effects of colored inks.

Color-to-color bleed: A common characteristic of ink-to-printable media interaction causing degradation in print quality by the bleeding of one color into an adjacent color.

Black-to- yellow color bleed is the most noticeable.

Black density: A measure of black ink image intensity using a reflectance densitometer.

CMY density: A measure of color ink image intensity (cyan (C), magenta (M), and yellow (Y)) using a reflectance densitometer.

Edge acuity/resolution: The process or capability of making distinguishable the individual parts of an object, in closely adjacent optical images.

Water fastness: The amount of colorant transferred from a printed area to an unprinted area when deionized water is dispensed at a 45° angle on the printed sample.

Table 2 - Ink Jet Label Performance Attributes

Property ¹	Control 1	Ex. 1	Ex. 2	Ex. 3	Control 2
Black Dry Time	9	8.5	8.5	8.5	4
Black Text Quality	8	8	8	8	2
Black Fill	9	9	9	9	9
Color Dry Time	10	10	10	9.5	9
Color Text Quality	8	8	8	8	2
Color Fill	9	9	9	9	9
Color-to-Color Bleed	3	6	6	6	3
Black Density	8	8	8	8	9
CMY Density	8	8	8	8	9
Edge Accuity/Resolution	6	9	8.5	8.5	3
Waterfastness	3.5	6	6	7.5	4

¹ Scale 1-10 with 10 being best

As shown in Table 2, the print quality of Examples 1-3 was comparable or superior to that of Controls 1 and 2 in every category, with notable improvements in color-to-color bleed, edge accuity/resolution, and waterfastness.

In view of the preceding description, it will be apparent to a person skilled in the art that a number of variations can

be made without departing from the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Throughout the text and the claims, use of the word "about" in relation to a range of numbers is intended to modify both the low and the high values stated.

WHAT IS CLAIMED IS:

1. A composition, comprising: a mixture of polyvinyl pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone.
2. A composition as recited in claim 1, wherein the chromium complex contains a C₁₄-C₁₈ fatty acid coordinated with trivalent chromium.
3. A composition as recited in claim 1, further comprising a solvent.
4. A composition as recited in claim 3, wherein the solvent comprises an alcohol.
5. A composition as recited in claim 4, wherein the alcohol is n-butanol.
6. A composition as recited in claim 5, further comprising an organic acid.
7. A composition as recited in claim 6, wherein the organic acid is acetic acid.
8. A composition as recited in claim 3, wherein the solvent comprises a mixture of alcohol and water.
9. A composition as recited in claim 8, wherein the alcohol is isopropanol.
10. A composition as recited in claim 9 further comprising polyethylene imine.
11. A composition as recited in claim 1, wherein the composition comprises from about 2 to 30 wt% polyvinyl

pyrrolidone, about 2 to 10 wt% silica, and about 0.25 to 1 wt% chromium complex.

12. A composition as recited in claim 11, further comprising from about 50 to 95 wt% solvent.

13. A composition as recited in claim 12, wherein the solvent is n-butanol, and the composition further comprises about 0.1 to 5 wt% acetic acid.

14. A composition as recited in claim 12, wherein the solvent is a mixture of isopropanol and water, and the composition further comprises from about 1 to 25 wt% polyethylene imine.

15. A composition as recited in claim 1, wherein the polyvinyl pyrrolidone has a K value of from about 60 to 100 and a weight average molecular weight of from about 300,000 to 2,500,000.

16. A composition as recited in claim 1, wherein the silica comprises a silica gel.

17. A construction, comprising:
a facestock having first and second surfaces;
a pressure-sensitive adhesive coated on or laminated to the facestock's first surface; and
an ink-receptive topcoat applied to the facestock's second surface, said ink-receptive topcoat being formed from a composition comprising a mixture of polyvinyl pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone.

18. A construction as recited in claim 17, wherein the chromium complex contains a C₁₄-C₁₈ fatty acid coordinated with trivalent chromium.

19. A construction as recited in claim 17, wherein the composition further comprises a solvent.

20. A construction as recited in claim 19, wherein the solvent comprises an alcohol.

21. A construction as recited in claim 20, wherein the alcohol is butanol.

22. A construction as recited in claim 21, wherein the composition further comprises an organic acid.

23. A construction as recited in claim 22, wherein the organic acid is acetic acid.

24. A construction as recited in claim 19, wherein the solvent comprises a mixture of alcohol and water.

25. A construction as recited in claim 24, wherein the alcohol is isopropanol.

26. A construction as recited in claim 25, wherein the composition further comprises polyethylene imine.

27. A construction as recited in claim 17, wherein the composition comprises from about 2 to 30 wt% polyvinyl pyrrolidone, about 2 to 10 wt% silica, and about 0.25 to 1 wt% chromium complex.

28. A construction as recited in claim 27, wherein the composition further comprises about 50 to 95 wt% solvent.

29. A construction as recited in claim 28, wherein the solvent is n-butanol, and the composition further comprises from about 0.1 to 5 wt% acetic acid.

30. A construction as recited in claim 28, wherein the solvent is a mixture of isopropanol and water, and the composition further comprises from about 1 to 25 wt% polyethylene imine.

31. A construction as recited in claim 17, wherein the polyvinyl pyrrolidone has a K value of from about 60 to 100 and a weight average molecular weight of from about 300,000 to 2,500,000.

32. A construction as recited in claim 17, wherein the silica comprises a silica gel.

33. A construction as recited in claim 17, further comprising a release liner in contact with the pressure-sensitive adhesive.

34. A construction as recited in claim 33, having a plurality of die-cut labels thereon, with die-cuts extending through the facestock and pressure-sensitive adhesive but not the release liner.

35. A construction as recited in claim 17, wherein the facestock is substantially transparent.

36. An ink jet-printable construction, comprising:
a release liner having first and second surfaces;
a pressure-sensitive adhesive layer having first and second surfaces, the first surface of said pressure-sensitive adhesive layer abutting the second surface of the release liner;

a polyester film having first and second surfaces, the first surface of said polyester film abutting the second surface of said pressure-sensitive adhesive layer; and an ink jet-receptive topcoat having first and second surfaces, the first surface of said ink jet-receptive topcoat abutting the second surface of said polyester film, said ink-jet topcoat

being formed from a composition comprising a mixture of polyvinyl pyrrolidone, silica, and a chromium complex capable of crosslinking polyvinyl pyrrolidone.

37. An ink jet-printable construction as recited in claim 36, wherein the composition further comprises a solvent.

38. An ink jet-printable construction as recited in claim 37, wherein the solvent comprises an alcohol.

39. An ink jet-printable construction as recited in claim 38, wherein the alcohol is butanol.

40. An ink jet-printable construction as recited in claim 39, wherein the composition further comprises an organic acid.

41. An ink jet-printable construction as recited in claim 40, wherein the organic acid is acetic acid.

42. An ink jet-printable construction as recited in claim 37, wherein the solvent comprises a mixture of alcohol and water.

43. An ink jet-printable construction as recited in claim 42, wherein the alcohol is isopropanol.

44. An ink jet-printable construction as recited in claim 43, wherein the composition further comprises polyethylene imine.

45. An ink jet-printable construction as recited in claim 36, wherein the composition comprises about 2 to 30 wt% polyvinyl pyrrolidone, about 2 to 10 wt% silica, and about 0.25 - 1 wt% chromium complex.

46. An ink jet-printable construction as recited in claim 45, wherein the composition further comprises about 50 to 95 wt% solvent.

47. An ink jet-printable construction as recited in claim 46, wherein the solvent is n-butanol, and the composition further comprises from about 0.1 to 5 wt% acetic acid.

48. An ink jet-printable construction as recited in claim 36, wherein the polyvinyl pyrrolidone has a K value of from about 60 to 100 and a weight average molecular weight of from about 300,000 to 2,500,000.

49. An ink jet-printable construction as recited in claim 36, wherein the silica comprises a silica gel.

