Chapter 7 - Coating

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The Coating

December 2000

The Coating is the most important element of a platinum palladium print. Technique, paper, exposure, processing, finishing, all contribute important elements to the final print. But none are as significant as the Coating. The Coating consists of solution preparation, mixing, understanding coverage and coating efficiency, application technique and experience, and drying. It is the most labor intensive, skilled craft, and controlled art at the heart of the Pt/Pd process. If one is to master the Pt/Pd process, they must master the Coating. The various elements of Coating are contained in several sections (Chapter 7) and studies (Chapter 15) throughout this guide. One must also keep in mind that other parts of the process may influence Coating, such as to assure efficient clearing, additives are given to the Coating.

Info links:

Preparing the Coating Mixture
Coating Coverage
Coating Efficiency
Coating Paper
Coating Fabric
Drying the Coating
Wet Dry Drying Study
Quasi Multi-Coating Method
Clearing Study
Verification of Optimized Formulae
Threshold for FO Solutions

Coating Equipment

updated February 2001

Preparation Equipment:

Tape (optional)
: Used for writing on fabric.

Pencil
: Used to mark area to be coated or identify print.

Sonic Mister
: Most paper should be humidified to get the best coating results. This may be noticed as increased substance within the print. The humidity seems to open the pours of the paper letting the chemistry soak in better and more completely. Some thin papers like Bienfang 360 do not require humidification (in fact, if too humid, this paper will have a curling problem). The sonic mister is preferred to steam because all papers coat better when they are cooler.

Shot Glasses
: These are convenient to mix and hold coating solutions; have several.

Hot Plate (Coffee Warmer)
: This is used to keep some of the metal solutions dissolved.

Brushing Equipment:

Brushes, White Sablene
: These brushes have soft, thin, nylon bristles. The chisel type, wide and thin, are recommended.

: The brush is a most important tool for this process. Too large of a brush will soak up the coating. Too small of a brush will take too long to brush on the coating.

: Red Sable brushes work fine, but are expensive. Any other brush will probably give problems. White sablene is actually a very fine nylon (and relatively inexpensive). This type of brush along with Red Sable is very soft. Take a brush and rub it on the back of the hand (feel how soft). What happens is that other brushes will abrade some or all of the paper

fibers when coating. This shows up in the print as patchy textured areas. The foam brushes are some of the worst to use. A glass rod (as mentioned in some texts) may not press the chemical coating into the paper as will a brush. This might result in blotchy areas in the print. Also, glass rods may catch a dirt speck and scratch the paper, whereas a brush will pick up the speck. However, glass rods have been and are successfully used by many printers. Dipping the paper into a coating solution is not practical since it can waste most of the chemistry.

recommended sizes:

0.5" for 4x5 or smaller
1" for 4x5 to 8x10
1.5" for 8x10 to 11x14
2" for 16x20
or two or more in jig for larger than 11x14

Small tray for soaking coating brush

This tray MUST be dedicated to this function ONLY.

Drying Equipment:

Blow Drier (hair drier)

A must for drying coatings. A two speed, two heat drier is versatile. A no heat setting is a must. An accessory worth trying is a diffuser (especially if drying fabric or large prints). Two things to be very careful of are: Do not blow on the coating until the gloss has vanished (this may cause puddling and can show up in the print as light blotchy areas). Do not get coating too hot (140^{o}F can be too hot and may be demonstrated in the print as deteriorated quality).

Clothes Pins or Clips and Line

These are used for drying or for holding wet fabric temporarily. Stainless steel (do not touch wet coating) or plastic are suitable.

General Equipment:

Paper Towels

Useful to squeegee brushes or clean spills.

Glass Plate or Plastic Sheets

To protect table from coating spills or overruns. These are definitely a necessity when coating fabric. Optionally, a pad of newsprint could be used when coating paper.

Light Tight Container (such as a 4x5 film development tank)

This is useful for storing the bottles of sensitizer solutions.

Preparing the Coating Solution

updated December 2000

There is a lot of art in the making of the coating solution. (The chemical solution is not an emulsion.) Many choices are at hand to influence the look of the print. Some general tendencies are described below, however one must try things for themselves to discover the nuances they prefer in a particular print.

Note: All coating and mixing must be done in safelight illumination. It is important to check if the working illumination is safe by performing the Fogging Test.

Note: Any coating chemistry that spills on clothing and is illuminated by light will produce a stain that can only be removed with a pair a scissors. Any coating chemistry that spills should not be used for important prints but should be recycled if practicable.

Coating Components:

Sensitizer:

This must be included as it makes the coating light sensitive. There are two major routes to take with the selection of the sensitizer. Ferric Oxalate (FO) provides what is called a Developing Out Process (DOP). Ammonium Ferric Oxalate (AFO) generally provides what is called a Printing Out Process (POP). Each of these processes has its own characteristics. With DOP a developer is used; with POP the print goes straight into a water bath and then clearing.

Note: Only use a sensitizer solution that is known to be good and of the highest quality.

FO DOP - allows for a variety of developers or enhancing agents.
Provides for the best depth and substance.
In general, FO requires less metal (solutions may be weaker) than AFO.

AFO POP - no developer may be required. However, use of Potassium Oxalate developer will dramatically reduce contrast in the highlight values only. Provides more neutral color at higher relative humidity. Cool, bluish color may be obtained with addition of some Pt double salt. A 60% solution of AFO with the appropriate amount of metal can provide the best depth and substance of FO. In general, AFO must use more metal and higher strength solutions to achieve results comparable to FO.

Metal Solution:

The metals are what form the final image. The metal solutions are made from what are termed double salts of the noble metals platinum (Pt) and palladium (Pd). These have the form X_2MCl_4 in which X represents a period I element (alkali metal) and M represents the Nobel metal (Cl is the symbol for Chlorine).

Pt/Pd RATIOS:
The following evaluates general relationships for the ratios of Platinum to Palladium solutions for DOP. The strengths of the individual solutions are determined by the sensitizer and can be found in the section on Optimization or calculated from the Metal Solution Formula Calculator (requires JavaScript capable browser).

100% Platinum

80% Pt	There is not much noticeable difference between 80% and 100% platinum.
50% Pt	More Pt will discriminate sharper detail; produce cleaner whites; more contrast; a colder, blacker image; exposes faster. More than 50% is rarely used.
35% Pt	Maximum substance in image for most papers occurs at 25% to 35% Pt
25% Pt	Good ratio for fabric is from 10% to 30% Pt
10% Pt	Warmer, browner image; less contrast; exposes slower.
0% Pt	100% Pd gives slightly pinkish highlights, also will discriminate very high values. Can discriminate Zones IX, X, XI, and even XII. Palladium tends to cling to the paper fibers better making clearing more difficult.

Note: The platinum solutions for both DOP and POP should be warmed, but kept below 140°F.

Double Salts of Palladium:

Several Pd salts have been used and can produce various results. This are represented by X_2PdCl_4, where X is one of the alkali metals, lithium (Li), sodium (Na), or potassium (K).

Li	Achieves the most neutral color with POP (high RH). Orangeish brown with DOP. Solutions stay dissolved at room temperature for both DOP and POP. Holds the most moisture in the coating.
Na	Warm yellow, brown color with POP. Yellowish brown color with DOP. Na may react with the Pt salt at higher temperatures causing a precipitate. Solution for POP must be heated in water bath to keep dissolved.
K	Slight warm color with POP. Warm deep brown color with DOP. Solutions must be heated in water bath to keep dissolved for both DOP and POP.

Contrast Agent:

There are several agents that can be used to increase contrast either throughout the entire tonal range or within a local range. These agents can be part of the coating or can be used in the subsequent processing as with those added to the developer. When used in the coating, the are administered as a single drop of a certain percentage solution added to the coating mixture. The contrast agent should always be the last ingredient added to the coating mixture. Some unique effects may occur by mixing multiple contrast agents. A few agents are discussed below. Some general tendencies are as follows.

* It is usually best to get the proper contrast in the negative.
* Sometimes use of a contrast agent will prevent base fogging.
* Less contrast agent may give more of a printout with DOP.
* More contrast agent generally requires more exposure.

Potassium Chlorate -

This is the traditional contrast agent. It tends to work mostly onthe upper tone values. Less gives a better quality print. However, sometimes some gives a better quality print than none. ½% to 1% (and for some papers 2%) is the maximum amount for an 8x10 with most papers before image degradation is noticed. Too much Potassium Chlorate will hurt the paper, degrade the image, or add a lot of grain.

Hydrogen Peroxide -

Hydrogen Peroxide wont degrade the paper or image like Potassium Chlorate. However, the larger concentrations of Hydrogen Peroxide may cause the platinum salt solution to precipitate platinum or convert to K_2PtCl_6 (not very soluble in water).

Potassium Dichromate or Ammonium Dichromate -

Higher concentrations do not seem to harm the paper like Potassium Chlorate. Potassium Dichromate may be added to the coating mixture (internal control) or to the developer (external control), each producing some unique results. Ammonium Dichromate is thought to provide for a true contrast adjustment. Ammonium Dichromate provides for a more neutral color than other contrast agents for POP.

Na_2PtCl_6 -

Richard Sullivan has provided some interesting information on the use of this Pt salt for contrast control. His tests have shown it to provide true contrast control without detrimental effects. (technical paper at this link) Dick Arentz also describes this contrast control in his latest book

Mixing the Coating:

The basic mixing rules are these:

Components are added in the following order: sensitizer, metals, contrast agents.
Total amount of metallic salts is equal to the amount of sensitizer.
There is only one drop of a contrast agent.

Procedure:

Set out a shot glass.
Enter coating information in notebook (see notation below).
Count out drops of sensitizer (FO, AFO) from a dropper (or use ml from a pipette).
Calculate drops (or ml) of Pd and Pt solutions for the Pt/Pd ratio desired.
Add drops (or ml) of Pd (Li, Na, K).
Add drops (or ml) of Pt.
Swish around to mix.
Add one drop of ?% solution contrast agent.
Swish around to mix and set aside for coating.

Note: It has been observed that for most POP and some DOP situations, results (apparent in the print) are better when the contrast agent is added last.

Note: It is good practice to mix each coating solution immediately prior to coating. Some mixed coating solutions have been observed to precipitate crystals if cooled or not used within 10 minutes. Mixed coating solutions should not sit or be stored for more than an hour as the mixture can "sour" resulting in a noticeable loss of print quality or inconsistent results.

Coverage:

Coverage determines the total amount of coating mixture to prepare for a print. The coverage of a coating varies by substrate, coating procedure and technique, and conditions and should be determined by experience and as explained in the section on Coating Coverage.

General Expectations:

Too much chemistry wastes $ and may cause blotchy areas.
Too little chemistry will weaken the image.
Papers with more absorbency will require more chemistry.
Higher ambient temperature will require more chemistry on thicker papers.
In general fabric will require three times the chemistry as an equivalent area on paper.
Papers coat better when cooler (use a sonic mister rather than steam to humidify).

Keeping Notes - NOTATION:

Always record the paper and coating chemistry in the notebook.
The following abbreviations can provide for quick and accurate notations.

General notation = [sensitizer]-[metal solutions]-[contrast agents]

sensitizer:

#FO% = Ferric Oxalate
#AFO% = Ammonium Ferric Oxalate

where
= amount in drops or ml
% = solution strength
Note: If more than one source of FO is available, an additional letter can discern the difference, such as VFO, JFO, BFO, etc.

Pd solution:

#L = Li_2PdCl_4
#N = Na_2PdCl_4
#K = K_2PdCl_4

where
= amount in drops or ml
Note: Solution strength is not needed as the solution strength of the metals is determined by the solution strength and type of sensitizer.

Pt solution:

= K_2PtCl_4
or #P

where
# = amount in drops or ml
P = Pt salt (This is optional unless more than one Pt salt is used, then notations can be used such as KP, NP, AP, etc.)
Note: Solution strength is not needed as the solution strength of the metals is determined by the solution strength of the sensitizer.

Note: Half strength solutions of metal solutions may be indicated by a /2 after the #.

contrast agents:

%PC = Potassium Chlorate
%PD = Potassium Dichromate
%AD = Ammonium Dichromate
%HP = Hydrogen Peroxide

where
% = solution strength

For example, an 8x10 coating for Bienfang 360 paper may be expressed as: 12BFO27-9K-3-1/4PD

Coating Efficiency

created August 1999, updated December 2000

Explanation of Coating Efficiency:

Coating efficiency is the percentage of chemistry that goes from the coating mixture into the paper. Losses are typically from brush absorption or clinging to the wall of the mixing/pouring vessel. Other losses can occur from mistakes and evaporation. Mistakes can be avoided by careful technique; the other losses are discussed further.

The brush can suck up a lot of the mixture. Pre-soaking the brush and squeezing it out helps to prevent some absorption loss. When dealing with a relatively small amount of mixture this loss can significantly lower the coating efficiency. Several drops could be held by a larger brush; a smaller brush for smaller coating areas is a good idea. It is recommended that the brush have a width of no more than 15% of the shortest side of the coating area (recommended brush sizes). A rod should have a much lower loss than a brush, although some mixture does cling to the rod. A rod with a large diameter or textured surface can contribute to a significant loss of coating solution.

Mixture also clings to the vessel from which it was mixed and poured. This amount becomes significant for a small amount of coating mixture. One drop could easily cling, which would be 10% of a 10 drop solution. It is recommended that the brush be used to wipe any remaining mixture from the vessel.

Because of the variability of these losses with the amount of coating mixture, it is recommended that coating efficiency be measured for both small and large area coatings of sizes typically used.

Evaporation can contribute a variable and uncontrollable loss of water from the mixture. This does not cause a loss of active material in the coating, but it does play havoc with determining the efficiency. It is recommended that the weighing (discussed below in the Measurement Procedure) be conducted at lower temperatures, without any cross ventilation, and as quick as possible. For the measurement of efficiency, single coatings are a must. Multiple coatings (with the quasi drying between layers) loose too much of the water to provide a useful and consistent weight measurement.

Evaporation can be more pronounced in an ambient of low relative humidity. It is recommended that the coating efficiency be measured in ambient conditions of 50-70% RH with the paper stabilized at the ambient. A change in RH of the paper is easily detected by a changing weight.

Measurement of Coating Efficiency

Measurement Procedure:

All weights are measured with a scale capable of accurately measuring 0.01 grams.

✓ Select a paper of interest and cut to slightly larger than 100 square inch (about 654 cm2).
✓ Delineate a 100 square inch area on the paper.

- ✓ Weigh the paper.
- ✓ Weigh a shot glass.
- ✓ Make up a typical coating mixture for an 8x10 area in the shot glass.
- ✓ Weigh the shot glass with mixture.
- ✓ Make sure scale is set to zero balance (ready to weigh paper).
- ✓ Apply the coating by the well practiced and consistent technique to the paper within the marked area of 100 square inches using the appropriate tool.
- ✓ The coated paper is immediately weighed (no drying).

Calculation of Coating Efficiency

The initial weight of the chemistry mixture is:
[weight of shot glass with mixture]-[weight of shot glass] = [weight of mixture]

It is assumed that the chemistry delivered to the paper is:
[weight of post-coated paper]-[weight of pre-coated paper] = [weight of mixture coated]

The coating efficiency is calculated as follows:

[coating efficiency] = [weight of mixture coated] / [weight of mixture]

Coating Coverage

created August 1999, updated December 2000

The potential quality of a print is directly associated with uniformly placing a desired amount of metal into a desired area on a particular substrate. Accuracy and consistency of the coating technique is of critical importance. It is highly recommended that all coating adhere to the following.

- Only Optimized solutions should be used. (See Chapter 6)
- The coating must fully and accurately be kept within a defined area.
- Brushing or spreading technique must be practiced and consistent.
- The coating efficiency should be known for each bushing or spreading technique, and reevaluated if any change of bushing or spreading occurs.
- The volume per drop must be known and consistent, if droppers are used to make the coating mixture. The droppers must be of the same type and have the same drop size. Accurate pipettes may be used instead of droppers and will be more accurate.
- If one must error, a denser coating only wastes material, while a weak coating adversely affects quality.

Definition of Coverage:

Coating Coverage is expressed as cm^2/ml and defined as:

[Coverage] = [area of coating in cm^2] * [coating efficiency] / [ml per drop] / [number of drops of sensitizer at specified solution concentration]

where,

[coating efficiency] is the percentage of chemistry that goes from the mixture into the paper. Refer to the section on Coating Efficiency for its description and measuring procedure.

[ml per drop] is calculated by counting the number of drops (#) it takes to fill a graduated cylinder to 10 ml, then calculating (10/# = ml/drop) (This term is eliminated if pipettes are used and solution measurements are made in ml instead of drops.)

[number of drops of sensitizer at specified solution concentration] is determined by either of the following options:

A) experience and consistency of coating and performing the optimization study in Verification of Optimized Formulas, except finding the optimum number of drops (or volume) of the specified sensitizer solution for the given area (as opposed to determining the solution strength). This is accomplished by varying the amount of given coating mixture for a given area.

B) experience and consistency of coating as suggested in this Guide (Chapter 7), and using the recommended value for a particular paper. This choice relies on measurements made by the author, whereas option A requires the performance of the optimization study.

Note: If using pipettes, enter the amount in [ml of sensitizer at specified solution concentration] in place of [ml per drop] / [number of drops of sensitizer at specified solution concentration]

IMPORTANT: Because diluted mixtures may be made (perhaps for multiple coatings), the total number of mixture drops (or volume) is not an accurate reference. The appropriate reference is the number of drops (or volume) of sensitizer solution of a given concentration, which is identical to the number of drops of metal solution. The purpose of coating is to get a known amount of active chemicals evenly distributed throughout the coated area. Coverage must indicate that amount.

Coverage can vary by paper and should be determined for each paper. Knowing the Coverage will permit the easy transition from one paper to another without the worry of insufficient chemistry. Coverage can also vary with coating size as a variation of the Coating Efficiency. Coverage should be calculated for the sizes and the specific paper which are commonly used.

Coverage Example:

An example to calculate drops needed using the Coverage:
An 8x10 image with half inch boarders (100 inches2 or 645 cm2), using a dropper having 0.05 ml/drop, on a paper with a Coverage of 829 cm2/ml and a coating efficiency of 0.90 (90%), the number of drops of sensitizer would be calculated as follows.

drops = [area coated] / [ml per drop] / [Coverage] * [efficiency] = 645 / 0.05 / 830 * 0.90 = 14

A coating mixture for this 8x10 would consist of 14 drops of sensitizer, 14 drops of the appropriate metal solution(s), an optional drop of contrast agent, and any optional dilution water (as when Quasi Multi-Coating). The coating would be evenly spread onto an area of 645 cm2.

Some Coverage Values:

The values below are for the purpose of demonstration. The Coverage of a coating may vary by coating technique and should be determined as outlined above including determination of the coating efficiency. Coating coverage may decrease at higher temperatures (especially greater than 75°F) for some papers.

The following substrates have Coverage as measured by the author.

Substrate		for an 8x10			for a 4x5		
name	type	coating efficiency	Coverage (cm^2/ml)	drops sensitizer	coating efficiency	Coverage (cm^2/ml)	drops sensitizer
Bienfang 360	thin paper	.92	76.5	24	.81	73.7	6
Crane's Parchment Cover	thick paper	.92	65.5	28	.81	63.2	7
Sea Isle fabric	fine fabric	.85	28.3	60	.78	28.4	15

Note: These Coverage values are for the standard temperature of 25°C, higher temperatures may require more solution depending on the substrate.

Note: An 8x10 image (roughly 8 ½ x 9 ½) with a 1/2 inch boarder on all sides has an area of 99.75 square inches. A 4x5 image (roughly 3 3/4 x 4 3/4) with a 1/2 inch boarder on all sides has an area of 27.31 square inches.

Coating Paper - step-by-step Procedure

updated May 2001

Coating can make or break the process. There is nothing mystical about coating, but one must practice coating. Only after coating several hundred prints may this simple technique be mastered. Coating technique and ease will vary from paper to paper. It is strongly suggested that one begin with an easy to coat paper; learn to coat it well; then maybe try another paper. It is to be expected that various papers will coat differently.

Preparation
Humidifying
Brushing
Drying DOP
Drying POP

Preparation Steps:

- Ambient work area preparation differs for DOP and POP and is an important step for consistency and quality. (See the Wet Dry Drying Study.)

- For DOP, the temperature should be kept below 70°F and the relative humidity (RH) below 40%.
- For POP, the temperature should be kept below 70°F and the relative humidity (RH) between 40% and 70%. Variations in the RH can change the color of the print, in genaral producing a warmer color with lower RH.

✓ Have brush soaking in a dedicated tray of H2O.

✓ Have coating mixture ready in shot glass.

✓ Have paper ready with the desired side up (see Raw Materials - Substrates - Paper).

✓ Mark on paper the area to be coated with pencil dots at corners. Or, if paper is thin, place old negative of same size under the paper as a guide.

Note: After some practice one should be able to coat the correct size without guides. However, it is critical to restrict the coating to a given area.

✓ With brush well soaked in dedicated tray, remove it from the H_2O and squeegee between a clean paper towel.

✓ Take most of the H2O out of the brush, but leave damp.

Note: This procedure is intended to keep the coating mixture from being sucked up into the brush (dry brush) or from being diluted (wet brush).

Humidification Steps:

✓ Humidify the paper by holding and moving paper over a sonic mister so that the front is

humidified, then so the back is humidified, then so the front is humidified again.

Notes: Do not get the paper soggy.

Do not get water droplets on the paper.

Do let the paper become humidified so that it just loses the crispness felt or heard when bending.

Some thin papers may not require humidification.

Brushing Steps (illustrations below):

✓ Place paper onto the coating work area desired side up (use a pad of newsprint or plastic sheet to keep spills or overshoots off the table). (figure A)

✓ Pour the shot of coating mixture in a line well inside one edge of image area. (figure B)

✓ Get all of the mixture out of the shot glass, with brush if necessary.

✓ Run brush down the line of mixture and spread. (figure C)

✓ Brush mixture across the paper perpendicular to the line. (figure D)

Notes: The previous four steps should occur as rapidly as practical.

Hold the brush at an angle of about 30° to the paper and pull along gently, but swiftly.

✓ Brush mixture in direction 90° to last brush direction. (figure E)

✓ Brush mixture in direction 90° to last brush direction and opposite to the first brush direction. (figure F)

✓ Brush mixture in direction 90° to last brush direction and opposite to the second direction.

✓ Repeat brushing in all four directions once or twice depending on how fast the coating mixture is soaking into the paper. (figure G)

Notes: Stop brushing immediately when some drag is felt. Brushing beyond this point can abrade the paper and show as a textured spot in the print.

Coating must be quick and gentile and cover the entire image area. If not quick the mixture may be lost into the paper.

Make sure the mixture is brushed thickly over the entire area. When coating is thin the image will be weak.

Don't waste the chemistry by brushing it out of the image area.

Do not let the mixture soak through the paper. This may hurt the uniformity.

Also, do not let the mixture puddle, as this will also hurt uniformity.

Surface brush marks in the coating should not matter as long as the coating is solid.

✓ Place brush and shot glass into H_2O bath (dedicated tray).

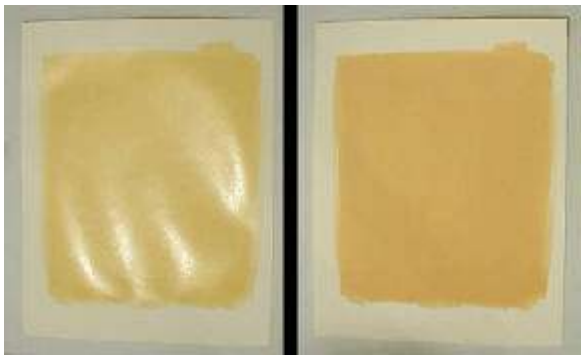
Illustration of brushing coating mixture onto paper:

A B C D E F G

Coating paper by brush: (A) everything ready; (B) pouring the solution; (C) initial spreading; (D) brushing across paper; (E) brushing at 90°; (F) brushing in next direction; (G) brushing in next direction on repeat.

Drying the Coating:

Drying methods differ for DOP and POP. Be sure that the ambient conditions of the work area are stabilized at the desired levels within parameters above.



Coated paper wet (left) and dry (right).

Drying steps for DOP:

✓ Let the coating air dry until the glossiness goes away.

Note: Paper may be lifted and turned to prevent puddling by gravitational distribution.

✓ Dry front with hair dryer at settings of high blow and low or medium heat.

Notes: It is desirable to use heat, but do not get coating too hot (more than 140°F may do damage.)

Puddles dried will show the edge and be blotchy.

✓ After front is completely dry, turn over and dry the back, then dry front again.

Notes: Coating must be "bone dry" for exposing.

Coated paper might be stored for up to an hour. Dry once again immediately prior to exposing. Never store for longer than an hour. The coating will depreciate with time; so, no matter how it is stored, it will go bad.

Do not let any liquid, or drops, or spray, or fingers touch the coating, because doing so will leave a mark in the print.

Drying steps for POP:

✓ Immediately dry with hair dryer at medium or high blow and NO HEAT.

Notes: DO NOT use heat as it is imperative that the coating and substrate obtain the relative humidity of the ambient.

Be careful so as not to cause any puddling of the chemistry. There is no time to wait until glossiness goes away as with DOP.

✓ Drying should take about three or four minutes. The goal is to get the paper and coating to the ambient relative humidity.

Notes: If too much time elapses from end of coating, through drying, to exposure, adverse effects may occur such as graininess.

To check when drying is complete, a finger may be lightly moved across the coating. When smooth and not sticky, the coating should be at the proper dryness.

Too much drying will result in a warmer color (color may be blotchy if the drying is uneven).

Expose immediately; do not store.

Do not let any liquid, or drops, or spray, or moist fingers touch the coating, because doing so will leave a mark in the print.

Coating Fabric - step-by-step Procedure:

updated December 2000

TIP: First learn to coat paper. Otherwise you will most likely get blotchy results and can waste a lot of material.

Preparation
Brushing
Drying DOP
Drying POP

Preparation Steps:

- Ambient work area preparation differs for DOP and POP and is an important step for consistency and quality.
- For DOP, the temperature should be kept below 70°F and the relative humidity (RH) below 40%, although higher RH does not seem to affect results.
- For POP, the temperature should be kept below 70°F and the relative humidity (RH) between 40% and 70%.

✓ Have brush soaking in a tray of H2O.

✓ Have mixture ready in shot glass.

Note: Remember fabric will require about three times the chemistry of paper.

Brushing Steps:

✓ Place fabric on glass or plastic sheet with the desired side up (see Raw Materials - Substrates - Fabric).

✓ Mark on the fabric the area to be coated with pencil dots at corners.

✓ With brush well soaked, remove it from the water and squeegee hard between a clean paper towel.

✓ Take most of the water out of the brush; brush should be just damp, not wet.

Note: This procedure is intended to keep the chemistry from being sucked up into the brush or from being diluted.

✓ Dip brush into the shot glass of coating mixture.

✓ Brush back and forth and up and down over a small area of the delineated fabric.

Notes: Keep coated areas wet with mixture. Do NOT brush thinly and let sit.
Work quickly. If an area dries, then marks may appear in the print.

Fabric is much more durable than paper. Brushing may be quite rough.

Be careful not to catch fabric and cause a fold or crease. The fabric will tend to expand when wet. Slight pulling from the sides will keep it flat. However, do not fasten or stretch the fabric in place.

Occasionally run wet (with mixture) brush over all coated areas to keep wet.

✓ Re-dip the brush and coat another area adjacent to the one just coated.

✓ Repeat the last step until the entire area is coated.

✓ Run wet (with mixture) brush in long strokes over entire coated area in every direction. This will force the mixture into the fabric. Also brush any air bubbles out to side.

✓ When fabric seems completely soaked, but before any areas have started to dry, lift the fabric off of the glass or plastic sheet.

Notes: There will be many small puddles of coating mixture left on the glass or plastic sheet. Do not let the fabric touch any of these once it is lifted and begins to dry.

From this point on do not let any liquid, or drops, or spray, or fingers touch the coating, because doing so will leave a mark in the print. Also, do not let the coated fabric touch itself.

✓ Hang the fabric up on a line with clips or clothes pins.

✓ Clean and dry the glass or plastic sheet. Residual coating mixture should be recycled if practicable.

Drying the Coating:
Drying methods differ for DOP and POP.

Drying steps for DOP:

✓ Dry the hanging, coated fabric with gentile blow and low to medium heat.

Note: A few clips to weight the bottom will keep the fabric from blowing around.

✓ When fabric is dry place it onto the clean and dry plastic or glass sheet.

✓ Dry further with the hair dryer at high blow and medium heat until "bone dry".

Notes: It may be a good idea to tape or hold the end of the fabric toward the hair dryer.

It is desirable to use heat, but do not get coating too hot (over 140°F may do damage.)

Coating must be "bone dry" for exposing.

✓ Once the fabric is completely dry, it is ready for exposure.

✓ Load into the printing frame and go immediately to exposure. Do not store the coated fabric.

Drying steps for POP:

✓ Dry the hanging, coated fabric with gentile blow and NO heat.

Notes: A few clips to weight the bottom will keep the fabric from blowing around.

Coating must be at ambient relative humidity for exposing.

✓ Once the fabric is at the ambient relative humidity, it is ready for exposure.

✓ Load into the contact printing frame and go immediately to exposure. Do not store the coated fabric.

Drying the Coating

created August 1999, updated December 2000

How the coating is dried can influence the print greatly. Also specific variations such as DOP and POP require drying specific procedures for optimal results. Two general procedures have been designed for drying the coating. These have been termed "Wet" and "Dry".

"Wet" means that the relative humidity of the coating is at equilibrium with an ambient RH of 40% to 70% (typically about 65% RH). This drying method is typically used with the Printing Out Process (POP). Drying is accomplished by blowing ambient air over the coating until just dry. Dryness may be checked by lightly rubbing a finger over the coating to check if smooth (not sticky). Over or uneven drying can produce blotchy areas of warmer color.

"Dry" means what has been traditionally termed "bone dry". The ambient RH is lowered to below 40% and the print dried by blowing air with medium heat over the coating to dry as much as practicable. The lower the ambient RH, the better. This drying method is typically used with the Developing Out Process (DOP). Not enough dryness may reduce the depth and richness of the darkest values in the print.

Drying scenarios in-between these may also be used.

Quasi Multi-Coating Method

created August 1999, updated December 2000

This author has had mixed results from multiple coatings in the past. A thought was that some of the past difficulties were associated with drying the mixture and then re-coating. Coatings of mixtures containing 50 % to 100 % additional mixture had been brushed into the same areas without problems. So, it was supposed that additional mixture could be added to the coating before it dried completely. (Hence the term "Quasi".) Keeping the coating moist seems to be the key to successful multi-coatings.

Multi-coating is not required on fabric as the coating method for fabric completely saturates the fabric with a single coating.

The Quasi Multi-Coating Method step-by-step procedure is as follows:

✓ Calculate the amount of chemistry needed for the mixture from the area to be coated, the Coverage factor for the paper (which depends on the type of paper, sensitizer and metal selection, and coating efficiency), and drop size (if measuring by drops). If measuring by drops, use this equation:

([# of drops] = [area coated cm^2] / [Coverage cm^2/ml] * [ml per drop])

Or if measuring by pipette use the following:

([ml] = [area coated cm^2] / [Coverage cm^2/ml])

✓ Dilute the coating mixture with H_2O so as to have enough volume for the number of coating layers anticipated (usually this will be double the amount which can accommodate at least three pouring layers).

✓ Pour out an amount of mixture onto the paper as typical for a single coating (usually half of that mixed and diluted).

✓ Brush this into the area desired as if it were a single coating.

✓ Allow to dry to the point of loss of the gloss, but before near dryness of any portion (rather damp).

✓ Pour out some more of the mixture (about half of that remaining).

✓ Brush this into the area desired as if it were a single coating.

✓ Allow to dry to the point of loss of the gloss, but before near dryness of any portion (rather damp).

✓ Pour and brush the remaining mixture as if it were a single coating.

✓ Dry to desired dryness for the "Wet" (POP) or "Dry" (DOP) method.

Each pouring should be enough to completely coat a layer over the full area. Do not extend any mixture beyond the area. With this Quasi Multi-Coating Method, it is of the utmost importance that the coating be restricted to the correct area. Spreading the mixture too thin (past the area) will result in a weakened coating which, if below the threshold, will produce a weakened print. Not spreading the mixture to fully to cover the area will result in a stronger (is places) but incomplete coating.

A coating mixture with five pouring layers (5 quasi coats) has been accomplished taking a little more than half an hour to coat and dry. This produced excellent prints, although additional texture could be felt on the surface of the paper. Similar quality prints were achieved with only the three pouring layers suggested without any roughening of the paper's surface texture.

Notes: Drying times are significantly lengthened with multiple coats.

If an initial pouring layer is allowed to get too dry, lighter blotchy areas may appear in the final print.