# Chapter 5 - Raw Materials


Chemicals . . . . . 5.1
Coating Chemicals . . . . . 5.1
Sensitizer . . . . . 5.1
Sensitizer Additives . . . . . 5.2
Metal Salts . . . . . 5.2
Salts . . . . . 5.3
Contrast Agents . . . . . 5.3
Processing Chemicals . . . . . 5.4
Developers . . . . . 5.4
Clearing Agents . . . . . 5.5
Other Chemicals . . . . . 5.6
Preparing Ferric Oxalate Powder . . . . . 5.7
Substrates . . . . . 5.8
PAPER . . . . . 5.8
FABRIC . . . . . 5.9
Paper Info . . . . . 5.11
Descriptions of papers . . . . . 5.12

# Chapter 5 - Raw Materials

## Chemicals

updated December 2000

Water
Coating Chem.
- Sensitizer
- Sensitizer Additives
- Metal Salts
- Salts
- Contrast Agents

Processing Chem.
- Developers
- Clearing Agents

Other

Many chemicals are used with the platinum palladium process that may not be used with other photographic processes. Any chemical should be appropriately stored, handled, and used. Storage and handling recommendations for most of these chemicals can be found in Chapter 2, Hazard Ratings and Storage Recommendations. Descriptions and notes for their use in the platinum palladium process may be found in this and other sections.

NAME
- FUNCTION
  - DESCRIPTION & NOTES

Tap Water
- Making Clearing Baths and Washing.
  - If high in iron, clearing will be adversely affected; use bottled water.
  - It is recommended to filter the tap water to 0.5 micron.

Distilled Water
- Making all coating chemistry and developer; rinsing coating brush
  - From steam distillation or reverse osmosis deionization.

— Coating Chemicals ---

Sensitizer:

Ferric Oxalate
- Sensitizer (used with DOP, developing out process)
  - Powder should be kept refrigerated and protected from light.
  - Must make up working solution 24 hours in advance. It should last several months.
  - Do not heat nor microwave this solution. Heat may harm it.
  - Keep the working solution cool and dark; but it is not necessary to refrigerate.
  - Light, heat, or time will convert Ferric Oxalate into Ferrous Oxalate.
  - Solution is greenish when ferric and yellowish when ferrous.

Ammonium Ferric Oxalate
- Sensitizer (used with POP, printing out process)

Make up working solution 24 hours in advance. It should last several months.
Keep the working solution cool; but it is not necessary to refrigerate.
Light, heat, or time may convert Ferric into Ferrous.

Sensitizer Additives:

Oxalic Acid
Sensitizer additive
White crystals. Clumps with humidity.
Studies have found a strength of 3% to 5% to provide better print sharpness.
It dramatically helps clearing and reduces clearing times.

EDTA
Sensitizer additive
White powder.
It dramatically helps clearing and reduces clearing times.

Note: More information on how individual sensitizers and additives effect the print can be found in the section Preparing the Coating Solution.

Metal Salts:

Platinum [ $K_2PtCl_4$ ]
Metallic Salt
Red powder or crystal.
Any yellow or brown material is $K_2PtCl_6$, which is only slightly soluble in water.
$K_2PtCl_6$ leaves a precipitate in the solution which may result as black specks.
Do not heat the solution or the powder to greater than 140°F.
Heat can convert it to $K_2PtCl_6$ (especially over 140°F).
The existence of sodium increases the susceptibility of conversion into $K_2PtCl_6$.
When in a hot climate, the substituting of potassium for sodium with the palladium salt will help prevent black specks in the print thought to be caused by $K_2PtCl_6$.

Palladium [ $Li_2PdCl_4$, $Na_2PdCl_4$, $K_2PdCl_4$ or $PdCl_2$ ]
Metallic Salt
Brown crystal.
The double salts ($X_2PdCl_4$) are Hydrophilic making weighing difficult.
Less expensive than platinum.
Has other advantages too; see mixing coating solution.
To get the mixture into solution the first time, it must be heated.
Use the double boiler method with hot water (very hot tap water will work).
Once in solution it will stay there, except when potassium or supersaturated solutions

are used, requiring heating before each use.

## Salts:

Lithium Chloride
Salt
White crystal.
This may be used in the palladium solution.
When used with Ammonium Ferric Oxalate sensitizer, this salt produces the most neutral color.
When mixed with water, heat is released (exothermic reaction).
CAUTION: Solution can get hot to the touch quickly when mixed and may break a weak bottle.

Sodium Chloride
Salt
White crystal.
Table salt works, but prefer use of the more expensive reagent grade.

Potassium Chloride
Salt
White crystal.
This may be substituted for the NaCl in the palladium solution to keep Na away from the platinum salt. The disadvantage is that the required palladium solution will not stay soluble at room temperature. The solution must be kept warm during each use.

Note: More information on how individual metal salt solutions effect the print can be found in the section Preparing the Coating Solution.

## Contrast Agents:

Potassium Chlorate
Contrast Agent
White crystal. Strongly reactive, see Safety section.
A little will prevent fog and controllably increase contrast.
The print seems to lose substance without some Potassium Chlorate.
Too much will degrade the paper or cause image graininess.
Increases exposure time.

Hydrogen Peroxide
Contrast Agent
Clear liquid; typically a 3% solution.

Works like Potassium Chlorate, but will not hurt the paper.
May cause platinum salt to degrade (especially at higher concentrations).
Not as controllable due to its instability. Mixing fresh from stock helps.

Ammonium Dichromate
Contrast Agent
White powder. Health hazard, see Safety section.
Supposedly provides true contrast control.

Potassium Dichromate
Contrast Agent
Orange powder. Health hazard, see Safety section.
Provides contrast control internally (in coating) or externally (in enhancer.)
May give some nice edge effects and sharpness.
Edward Weston mentioned in his daybooks that this brought life to clouds.
It is used up, the Potassium Oxalate Bath must be kept replenished if used externally.
If used internally, some will collect in the enhancer (developer) thus altering it.

Note: More information on how individual contrast agents effect the print can be found in the section Preparing the Coating Solution.

— Processing Chemicals —

Developers:

Potassium Oxalate
Developer
White crystal. Endothermic when mixed with water.
This developer produces the best depth and substance in the print.
To mix, the water should be hot. The reaction of going into solution is endothermic (absorbing heat). The solution cools rapidly hindering further dissolving.
This bath should remain acidic for proper results.
To maintain a low PH, Oxalic Acid may be added, but is rarely needed.
Never allow any HCl, H3PO4, or other clearing bath acid to contaminate this bath.
A fresh solution may be seasoned by putting in a couple droppers full of the platinum solution. Replenish with fresh stock solution as needed, but start over with fresh solution when heavily used to prevent fogging.

Ammonium Citrate
Developer
This developer produces a very neutral color.
But, it can produce a slightly flat looking print.

Flatness can be avoided while achieving a more neutral color by mixing with Potassium Oxalate (50-50.)

Clearing Agents:

Phosphoric Acid
Clearing Agent
Clear liquid, usually 85% reagent grade
An excellent alternative to HCl. This bath will not bleach the image and works great.

Hydrochloric Acid
Clearing Agent
Clear liquid, it is recommended to use the 18-20% solution named Muriatic Acid.
High concentration is hazardous and should be used only with the proper equipment and precautions.
This is the traditional clearing bath. But, the traditional clearing times are in error. See section on clearing.
Works fine for some papers and fabric, but can bleach the image when using longer clearing times necessary for most of the thicker papers.

Citric Acid
Clearing Agent
White crystal
An alternative to the other acid clearing agents.

Sprint Fixer Remover
Clearing Agent
Liquid colored with blue exhaustion indicator.
One of the fastest clearing agents for most papers.

EDTA(Na4)
Clearing Agent
White powder
Seems to clear only when EDTA and Oxalic Acid are added to the sensitizer.

Sodium Sulfite
Clearing Agent
White crystal

Sodium Bisulfate
Clearing Agent
White crystal

Baking Soda
Neutralizing Agent
White powder
Add diluted acid (working solution) to baking soda and water to neutralize.
Do NOT add straight to any acid. This is NOT intended for acid spills.

Note: More information on how individual clearing agents effect the print can be found in the Clearing Study.

— Other Chemicals ---

Potassium Ferricyanide
Testing Agent
Red or deep red-orange crystal
This will harm platinum-palladium chemistry, even in the tiniest amount.
Be careful and clean when using.
Store in a location separate from any platinum-palladium chemistry.

## Preparing Ferric Oxalate Powder

This is an illustrated guide to the manufacture of Ferric Oxalate powder of the highest quality as produced by Vicente-M. Vizcay Castro. Written in August/1999, this guide is available in Spanish and English with the American English adaptation and verification of the process and testing by Jeffrey D. Mathias.

Link to Preparing Ferric Oxalate Powder

# Substrates

updated December 2000

Paper
Various Papers
Fabric
Considerations

The substrate provides support for the coating and the final resting place for the noble metals forming the image. But the substrate also can significantly influence the image through its color, surface texture, translucency, and reactions with the chemistry and processing. Selection of the substrate is an important decision and there are many substrates to choose from. The best material for a substrate seems to be cotton in the form of paper or fabric. Other materials can be used including wood pulp papers, some which can easily rival the best cotton papers. One important criteria for substrate selection is archival longevity being that the Pt/Pd process is one of the most archival image processes.

## PAPER:

Many papers work fine for this process, but many do not. However, some that do not work straight from the manufacturer can be made to work. Continuously trying new papers is a good idea. Variations have been found between different production runs of a single paper. It is a good idea that after a good paper is found, a large quantity of that batch or lot is purchased.

In general:

- Any paper with good tooth and a resistance to bleeding should be tried.
- The paper can affect the color of the print.
- The thinner the paper, the sharper the image.
- The smother the paper, the sharper the image.
- Paper may be 100% Cotton Rag, but it may also be an archival wood pulp paper.
- Use only a paper who's longevity and quality is worthy of a platinum-palladium print.

Take heed that some manufacturers are not consistent in their use of raw materials which can lead to batch variations and inconsistencies.

Every paper has two sides (usually referred to as the nap side and the screen side). One side is better to print on than the other. Sometimes that side is smother. Sometimes that side has less texture when dry after being wet. Sometimes that side has better tooth (characteristic to grab and hold onto the coating). Sometimes that side gives better depth to the print. Sometimes the other side just does not work. In any case, find the side that gives the best print and find a way to identify it. There may

be a watermark, a texture, or a screen mesh impression (when viewed with a loop). The good side will always be the good side. Paper is typically packaged with the same side always one direction. In general, paper is manufactured with a nap on the front surface. The nap is generally smother and more uniform, but many times the back side works better.

Some papers must be candled. They may look great, but have defects hidden inside. The final print always manages to display this defect as a black speck or spot. (A paper notorious for this is Strathmore 500 Drawing - hard surface or plate.) Place the paper over a light table and if anything is in there, it can be seen. Coat and print on the "clean" areas of the paper. Another problem indentified by candling can be pinholes.

Click here for some results for various papers.

FABRIC:

It is strongly recommended that one master printing on paper before attempting to print on fabric. This advice can save a lot of expense. Fabric typically requires about three times the chemistry than that use with paper.

A high quality 100% cotton finely woven fabric works best. The best are listed here:

- Sea Isle
- Pima
- Egyptian

Any type of cotton fabric can be expected to work well. Thicker fabrics, such as canvas, can be expected to require even more chemistry.

It is recommended to use fabric that is pre-shrunk. Registration is already hard enough.

Silk has been found to not work with this process. The acids drive the ferric and metal salts into the fibers where they remain to stain and deter the image. Further research may discover a way to clear these prints.

Considerations:

The paper or fabric should be cut larger that the negative. Prints may be trimmed when finished. Paper should be cut ahead of time and kept in boxes aligned with the good side up. This will let the coating step proceed quickly. For some papers and fabric consideration may be given to the direction of the grain or weave.

Substrate Sizes:

| NEGATIVE | RANGE | OPTIMUM |
|---|---|---|
| Smaller than 4x5 | 6x7 to 11x14 | 10x12 |
| 4x5 | 6x7 to 11x14 | 11x14 |
| 8x10 | 10x12 to 16x20 | 11x14 |
| 11x14 | 13x16 to 16x20 | 16x20 |
| Larger than 11x14 | 16x20 to full sheet | full sheet |

Note: The size selected should give plenty of room for handling. Remember, if a finger touches the coating, a mark may show up in the print. Consideration might also be made for printing and processing equipment sizes and the cost of the substrate.

# Paper Info

updated December 2000

PAPERS TESTED TO WORK WELL:
(not all papers have been tested)
Arches Platine
Artist Drawing Bristol - plate finish (#1 Sulfite)
Bee Vellum - 450
Bienfang Graphics 360 100% Rag Layout
Canson Vellum / 110 Vidalon
Cranes Distaff Linen
Cranes Parchment (or Business Card Stock)
Cranes Stationary with Kid Finish
Mirage - plate finish - 2 ply
Mirage - vellum finish - 2 ply
Rissing Gallery 100
Southworth Parchment Deed
Strathmore Alexandra Brilliant
Strathmore Carillon
Strathmore Tracing Parchment
Strathmore Ultra Marker

PAPERS TESTED TO WORK WELL, BUT ARE NOW DISCONTINUED:
Strathmore 500 Artist Drawing, Hard surface (old acidic process)
Strathmore 500 Artist Drawing, Medium surface (old acidic process)

PAPERS THAT DO NOT WORK WELL AS RECEIVED FROM THE MANUFACTURER:

| NAME | REASON |
|---|---|
| Most Bristles | Acid will separate plies |
| Any Unsized Paper | Coating will just soak through |
| Arches Johannot | Incomplete clearing, falls apart when wet |
| Bee 100% Rag Prepared Tracing #687 | Weak print, does not clear |
| Bienfang Admaster 406 R | Weak print, incomplete clearing |
| Canson Airbrush / coated | Does not coat well or clear |
| D'Arches Watercolor HP | Does not clear |
| D'Arches Silkscreening | No sizing, coating soaks through |
| Fisk C.S.2 | Does not clear |
| Fisk C.S.10 | Incomplete clearing |
| Mohawk Superfine (high finish) | Coating soaks through, blotchy print |
| Morilla Leonardo 100% Rag Drawing | Weak print, mottled |

| | |
|---|---|
| Multimedia Artboard | Weak print, does not clear |
| Neenah Old Council Tree | Muddy print, incomplete clearing |
| Neenah Old Council Tree Bond | Weak print, incomplete clearing |
| Rives BFK | Fogs |
| Simpson Protocol 100 | Week and blotchy prints |
| Somerset | Does not clear |
| Strathmore Gemini Watercolor HP | Incomplete clearing |
| Strathmore Layout | Some coating soaks through |
| Strathmore Script | Coating soaks through |
| Strathmore Writing (Bright or Ultra) | Weak print and incomplete clearing |

Please note that with the progress of new techniques and processing some of these papers tested previously may now work.

Descriptions of papers which work well with the Pt/Pd process.

Arches Paper

Arches Platine
Excellent quality, depth, and substance.
Very Good detail in print.
Excellent surface, good tooth, white color.
Easy to coat, no soak through, requires less chemistry that other papers.
Must be exposed immediately or black specks will be formed randomly.
Floats in clearing baths and wash.
Must have a final clearing in Sodium Sulfite.

Artist Paper

Artist Drawing Bristol - plate finish (#1 Sulfite)
Excellent quality, depth, and substance.
Very good detail in print.
Hard surface gives plenty of time to coat.
Coating must loose glossy look before blow drying.

Bee Paper

Bee Vellum - 450
Great quality with a lot of depth and substance.
Excellent detail in print.
Excellent luminosity from translucency, several thicknesses are available.
Translucent, color of print may be changed by colored under mat.
Average to coat, but watch for curling.

Bienfang Paper

Bienfang Graphics 360 100% Rag Layout
Excellent quality and substance with deep blacks and translucent whites.
Thin and very strong, even when wet.
Produces the sharpest image.
Tends to be slower and lower contrast, and has a very good printout.
Translucent, color of print may be changed by colored under mat.
Easy to coat, but be careful of wrinkling.
Easy to coat, does not need humidification.
Quick to dry, but let coating loose gloss.
May not be suitable for prints larger then 11x14 due to handling.
Finished prints tend to wrinkle with humidity.
Can be archival dry mounted (recommended for images larger than 4x5).

Canson Paper

Canson Vellum / 110 Vidalon
Good quality with a lot of depth and substance.
Detail in print is not as good as Bee or Strathmore.
Translucent, color of print may be changed by colored under mat.
Average to coat, but watch for curling.
Prints tend to wrinkle.

Cranes Paper

Cranes Distaff Linen
Great quality.
Nice smooth surface texture.
Several colors are available.
Difficult to coat, watch for soak through.

Cranes Parchment (or Business Card Stock)
Great quality, depth, and substance.
Yellowish color may be a problem. (Works well with brightening agents.)
Very nice surface, lots of tooth but smooth.
Average to coat, Soak through and brush marks are no problem.
Very easy to abrade surface, and difficult to spot.
Great heavy weight paper.

Cranes Stationary with Kid Finish
Great quality warmer image.
Nice smooth surface texture.
Several colors are available.
Difficult to coat, must be very quick, soaks up chemistry quickly.

Watch for soak through.

Mirage Paper

Mirage- plate finish - 2 ply
Excellent quality, depth, and substance.
Excellent detail in print.
Hard surface gives plenty of time to coat.
Coating must loose glossy look before blow drying.
Plies do not separate throughout wet process.

Mirage - vellum finish - 2 ply
Excellent quality with a lot of depth and substance.
Great detail in print.
Average to coat
Plies do not separate throughout wet process.

Rissing Paper

Rissing Gallery 100
Good quality, depth, and substance, some detail loss in image.
Very white paper base without brighteners.
Very nice surface, lots of tooth but smooth.
Average to coat.
Floats in acid baths and wash.
Difficult to spot and easily damaged surface.

Southworth Paper

Southworth Parchment Deed
Great results for some but not all images, renders good detail.
Average to coat, but watch for soak through.

Strathmore Paper

The Strathmore 500 papers mentioned here are manufactured by the "old" acidic process. The new "Acid Free Process" also incorporates a new sizing agent. It is this sizing agent that renders the new versions of these papers unusable. The image will have an overall appearance of a galvanized texture, especially in darker areas.

Strathmore 500 Artist Drawing, Hard surface
Excellent quality, depth, and substance.
Excellent detail in print.
Hard surface gives plenty of time to coat, but

Coating must lose glossy look before blow drying.
Difficult paper to coat, especially watch for puddling.
If not coated evenly (including brush marks), it will show in print.
Use plenty of chemistry and wait for it to soak in, the tendency is to spread the coating out too thinly resulting in a weak print.
Must be candled for defects, and there are plenty.

Strathmore 500 Artist Drawing, Medium surface
Great quality with a lot of depth and substance.
Average detail in print.
Texture shows in print, becomes disturbing in larger prints.
Easer to coat than hard surface.

Strathmore Alexandra Brilliant
OK quality print with some detail loss.
Very nice surface, good tooth.
Average to coat, no soak through.
New Alexandra does not have the sizing problems of Strathmore 500 paper.

Strathmore Carillon
Excellent tonal quality, depth, and substance.
Excellent surface, good tooth.
Average to coat, no soak through, watermark wont obstruct image.
New Carillon does not have the sizing problems of Strathmore 500 paper.

Strathmore Tracing Parchment
Great quality with a lot of depth and substance.
Excellent detail in print.
Excellent luminosity from extreme translucency.
Translucent, color of print may be changed by colored under mat.
Average to coat.
Prints tend to wrinkle.

Strathmore Ultra Marker
Great quality with a lot of depth and substance.
Excellent detail in print.
Translucent, color of print may be changed by colored under mat.
Average to coat.