

CASEIN PRINTING

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CASEIN is a colloid derived from milk. For those already-versed in gum printing, casein printing is done much the same way: a colloid is mixed with a light-sensitive dichromate and watercolor, brushed onto paper, and exposed under a negative to UV light. Where the light hits the most, the casein hardens the most. Where the light hits the least, the casein and pigment wash away in a simple water bath, and thus an image emerges. For each print, this exposure and development process is done multiple times, particularly for a tricolor print, which will require a red, yellow, and blue exposure to complete it.

Casein printing differs from gum printing in a number of ways, however.

- It is quicker to expose, from as little as 15 seconds to 4 minutes.
- A lesser-strength dichromate is best such as 10% potassium dichromate.
- It is quick to develop, in as little as several minutes to 15 minutes.
- It is very hardy, and alkalis such as ammonia or sodium carbonate as well as rougher methods of brushing can be used during development.
- The layer is thinner, resulting in a faster layer, a sharper layer, and a finer-grained layer, but one that still carries a high pigment load.
- Casein is dead-matte, not glossy, when powdered pigments are used.

Supplies

- ☑ Ammonium caseinate powder kit from Photographer's Formulary, which contains caseinate, sodium benzoate, and potassium dichromate
- ☑ Powdered pigments or tube watercolors (suggestions: Daniel Smith or M. Graham quinacridone rose, thalo blue, nickel azo yellow, lamp black, and/or burnt sienna)
- ☑ Gamblin PVA (Polyvinyl Acetate) Size
- ☑ 140lb watercolor paper like Fabriano Artistic, Arches Aquarelle or watercolor paper sold in convenient watercolor pads.

Paper preparation

More than likely, multiple printing will be done, so the paper should be preshrunk before the initial printing or successive printings will be slightly out of registration. Once the paper is preshrunk, it can be easily sized with non-toxic Gamblin PVA Polyvinyl Acetate Sizing and ready in minutes.

1. Cut all paper to the size needed. Save time and do a large batch at once.
2. Soak paper in hot water for a minimum of ½ hour.
3. Drain and hang the paper to dry.
4. Dilute PVA 1 part + 2 parts water.
5. Measure 5ml/1 teaspoon of solution per each 11"×14" paper and brush the PVA on the paper surface carefully and thoroughly. Some papers benefit from two coats; if so, dry slightly between coats.
6. Dry paper. Paper, once bone dry, can be used immediately. A hair dryer can be used to speed up drying time.

Potassium dichromate preparation (10%)

10g potassium dichromate (1¼ tsp.)

Water to 100ml

Measure out the dichromate crystals wearing gloves to minimize exposure. Do not breathe in the dust! Add the crystals to the water and bring the water to 100ml. Store this solution in a brown glass dropper bottle if desired. *Note: dichromates are poison. Label the dichromate bottle appropriately and keep out of reach of children. Do not eat or drink around dichromates. Always wear gloves when handling.*

Dichromates harden colloids, and eyes are colloidal. Do not splash dichromate in eyes and protect eyes. Dispose of dichromate in a safe manner as outlined in your area.

10% ammonium caseinate preparation

Mix small batches of casein at a time. Approximately 1ml covers 30 square inches, so a little goes a long way!

10g ammonium caseinate powder (2 Tb.)

90ml water (3 ounces)

1g sodium benzoate (about ¼ teaspoon)

10ml hot water (2 teaspoons)

Stir the casein powder into the 90ml water. It's non-toxic and can be mixed in a blender if desired. Blend on high for several minutes until thoroughly dispersed. It doubles in volume, but within a couple hours reduces from foam to a milky liquid. Pour the casein into a container, add the sodium benzoate dissolved in the 10ml/2 teaspoons hot water and store in the refrigerator if desired. This is easily enough for 20 tricolor 8"x10"s.

Coating mix preparation

At time of use, thoroughly mix together 1/8 teaspoon powdered pigment or tube watercolor + 1/2 teaspoon casein + 1/2 teaspoon potassium dichromate to coat up to 2 8"x10"s. Brush the coating on the paper. Smooth out the brush strokes with a dry brush held at a 90° angle. Let dry away from light. With such a thin layer the paper is usually dry within minutes if not ½ hour. For a tricolor casein print, start with either the

blue or red/magenta layer. Be sure to clean the brush *immediately* after use so the casein does not harden and ruin it. Tip: if the brush has gotten crusty, suspend the bristle tips in water with a bit of ammonia or sodium carbonate.

Note: Pigments that contain nickel, copper, manganese, chromium, iron or other metal salts will precipitate or throw down flakes or chunks of insoluble casein so the practice of making stock color solutions is not recommended.

Exposing

[Note: Making an appropriate digital negative is beyond the scope of this article. See *Gum Printing and Other Amazing Contact Printing Processes* or *PrecisionDigitalNegatives.com* to learn more.] Register the negative on the paper with registration marks before exposing. Blue is the fastest; yellow, red and black are slower, although this is not a hard and fast rule and dependent on pigment brand and amount. As little as ½–4 minutes under UVBL is sufficient for all colors. I have found blues to expose in under 2 minutes, reds in 2–3 minutes, and yellows in 3–4 minutes. If using the sun, an always-variable light source, these times should be cut way back, even by ¼x!

Processing

1. Place the print face up in a tray of *warm* to even hot water for a minute or two until all dichromate leaches out. This can be seen as yellow streaming out into the water from the borders of the print. Handle the print with tongs in this tray to minimize exposure to dichromates.
2. Transfer the print to a fresh tray of warm water for the remainder of the development time. Since the dichromate is all but gone from the print, it can now be handled. If necessary, prop the print up on a piece of Plexi and give it a gentle spray of water to release pigment in the highlights. Then return the print to the tray face down for the remainder of the development time.
3. Oftentimes, the development of the casein print is immediate, but more development is

needed to clear yellow dichromate stain. If the print is not developing quickly after the water spray, there is recourse: run a soft foam roller or a hake brush over the surface to clear the highlights. With casein this measure does not risk as much flaking and grain as with gum, and the grain, if revealed, is much finer. Automatic development (not touching the face of the print but merely letting the water do its thing) produces the smoothest print.

4. If the print is not developing, mix up a separate alkaline tray with up to 10–15ml ammonia per liter of water, or 2 teaspoons sodium carbonate per liter, or even a few teaspoons of baking soda. Alkalis speed up development. The print can be soaked in this bath for a minute, re-sprayed and returned to the water bath trays for the remainder of the development time. If these kind of chemical measures are always necessary, though, cut back on exposure time and/or use a denser negative with greater contrast.

5. Once the development is complete, hang the print to dry. When the print is completely dry, coat and process as per above once again. It may be necessary to use a size replenisher if alkalies have been used.

Troubleshooting casein

The coating develops white circles that look like popped bubbles.

- Called “fisheyes,” coating mix may be too thick so thin with a bit of water and keep brushing until they disappear.
- Sizing is too heavy.

The print does not develop but looks like a square of low contrast nothing.

- Negative is too low contrast or thin.
- Use a stronger size, even full strength PVA.
- Dilute dichromate to 5%.
- Cut exposure to even as little as 15 seconds with some colors (blue).
- Use hotter development water.
- Use an alkali in the water.
- Use a roller, scrubber, brush, or Scotch Brite pad to aid in developing the print, but replenish size before the next layer.
- Use a size replenishing coat between layers.

The print is too high contrast/the coating flaked off.

- Size is too heavy.
- Negative is too contrasty.
- Too much pigment is used in the coating mix.
- Layer is too thickly applied.
- Not enough exposure.

Sources for casein supplies

PhotoFormulary.com (ammonium caseinate, dichromate, benzoate)

Jerry'sArtarama.com and DanielSmith.com (watercolor paper, Gamblin PVA, watercolors, powdered pigments)

Our thanks go to Christina Z Anderson for permission to share her information.