



Mixing and Using a Substitute for KODAK POLY-TONER

GENERAL INFORMATION

KODAK POLY-TONER was discontinued due to extremely low sales volume. However, there are some photographers who prefer the unique tones this product provided with black-and-white papers. To enable these photographers to obtain these tones, we are providing the following formula to make a toner with properties very similar to the discontinued KODAK POLY-TONER. This formula is intended for personal use by photographers and darkroom technicians. Commercial manufacture and sale of toner using this formula is prohibited.

Home use may create other health and safety issues which cannot be predicted by Kodak's history with professional use. Please be advised that you assume all risks in making and using this formula. **Kodak assumes no liabilities for results or any injuries caused while using this formula.**

The information provided is intended to allow a small batch of toner to be produced using common laboratory equipment on a bench-top. Because of the smaller batch size, there may be some batch-to-batch variability in the resulting solution. For example, the filtration procedure described here may result in more or less removal of undissolved selenium metal from the solution, which could affect the toning results.

The solution produced by this procedure has received limited evaluation. Compared to KODAK POLY-TONER, the test batch provided results of similar image color. No evaluation of reproducibility of results or of keeping characteristics of the toner solution or of the toned photographic prints was done.

SAFETY PRECAUTIONS

Anyone attempting to mix the solutions from the directions provided should be familiar with the Material Safety Data Sheets for the components used, and their proper handling and disposal. Several of the components used to make the POLY-TONER or F-5a Hardener are extremely toxic or can cause severe skin and eye burns.

Use appropriate safety precautions and personal protective equipment including impervious gloves (neoprene rubber or nitrile are recommended), goggles or face shield, and mix in an area with proper ventilation.

The materials used to make POLY-TONER generally have a slight odor of hydrogen sulfide (described as rotten eggs or sewer gas). Users of the currently manufactured KODAK Brown Toner or the discontinued KODAK POLY-TONER will be familiar with this odor. **An extremely strong odor of hydrogen sulfide could be an indication of improper mixing.**

If this occurs, evacuate the mixing area immediately. Exposure to hydrogen sulfide can cause a rapid loss of sense of smell. High vapor concentrations can lead to collapse within seconds and may be fatal.

Cleaning the mixing and measuring apparatus used may also result in the decomposition of some of the material remaining on this equipment and the liberation of some hydrogen sulfide gas. This can be minimized by rinsing such equipment with a weak caustic solution such as a 10% solution of sodium carbonate, monohydrate, prior to flushing the equipment with water. This procedure may also reduce or eliminate the hazy residue that can form if the equipment is simply rinsed with water.

During preparation of either POLY-TONER or F-5a Hardener, use mixing/measuring equipment and storage containers dedicated for contact with photochemicals. Do not mix or store solutions in food preparation areas such as kitchens.

COMMENTS ON MIXING PROCEDURE

Photographic grade sodium carbonate should be used. Ordinary 0.45 micron laboratory filter paper was used for the test mix. "Coffee filter" paper may not be suitable for this use.

KODAK Brown Toner bottles and caps can be rinsed with 10% sodium carbonate solution, followed by water, and reused to store the new mix of toner. Remove the old labels, and label the bottles appropriately to avoid confusion. The starting solution, KODAK Brown Toner, contains significant levels of both sodium carbonate and sodium hydroxide. The additional quantity of sodium carbonate may not need to be measured with great precision, and the sodium hydroxide may not make a noticeable difference if it is left out. Therefore, a "less precise" mix using simplified measuring procedures is provided for less critical users.

OBTAINING CHEMICALS

You will need the following chemicals to make the toner. These chemicals are available through most chemical suppliers, such as Photographers Formulary, VWR Scientific, Cole-Parmer, or Fisher Scientific. You do not have to purchase the more expensive reagent grade chemicals; photographic grade or technical grade chemicals are acceptable. Selenium powder may be more difficult to obtain. This can also be obtained from Alfa Aesar or Reade.

For the toner:

- KODAK Brown Toner, CAT No. 146 4452, 8-ounce bottle (available through resellers of KODAK Products). You will need 4 bottles per batch of toner.
- Sodium Carbonate, monohydrate
- Selenium powder (CAS 7782-49-2)
- Sodium Hydroxide, 50% solution

KODAK Liquid Hardener, CAT No. 146 4239;
or to make F-5a Hardener:

- Sodium Sulfite (Anhydrous)
- 28% Acetic Acid
- Boric Acid, crystals
- Potassium Alum, (Dodecahydrated), fine granular; (also known as Potassium Aluminum Sulfate, (Dodecahydrated), or Aluminum Potassium Sulfate, (Dodecahydrated))

MIXING DIRECTIONS

Mix at room temperature, using a Teflon-coated stirring bar in a glass mix vessel of appropriate size (at least 2 litres or 64 ounces to minimize any spilling) on a magnetic mixer. With agitation sufficient to keep the materials suspended until they dissolve, add the ingredients in the order listed. Quantities are provided below to produce a mix that closely matches the toning performance of KODAK POLY-TONER, and to produce a mix requiring *less precise measuring*, that should yield similar results under most usage conditions.

1. Begin with three 8-ounce bottles of KODAK Brown Toner, CAT No. 146 4452.
2. With constant agitation, add 67.4 grams of sodium carbonate, monohydrate, photographic grade. *If a proper scale is not available, you can substitute two black plastic KODAK 35 mm Film containers, filled with sodium carbonate, monohydrate to approximately 1/4 inch from the top.*
3. With constant agitation, add 5.4 grams of selenium powder. *If a proper scale is not available, you can substitute 1 teaspoon of powder.*
4. With constant agitation, add 1.0 millilitres of sodium hydroxide, 50% solution. *This step can be eliminated if making the "less precise" mix.*
5. Agitate the mixture for a minimum of 30 minutes, then slowly add one additional bottle of KODAK Brown Toner, CAT No. 146 4452. Continue to agitate for at least 10 minutes.
6. Cover the solution to minimize evaporation and fumes, and let the solution stand for at least 12 hours with no agitation. Decant the solution through 0.45micron filter paper into a clean container. Change the filter paper halfway through if necessary to maintain a reasonable flow of solution. This process may take an hour or more.
7. Rinse the funnel with 10% sodium carbonate solution, followed by clean water. *To make a 10% solution, dissolve 100 grams of sodium carbonate in one litre of water.* Filter the solution a second time through laboratory filter paper.
8. Store the solution in clean, properly labeled glass or plastic bottles. KODAK Brown Toner bottles and caps can be rinsed with a 10% solution of sodium carbonate, followed by clean water, and reused to store the solution. Remove the old labels and properly label these bottles if you use them to store this solution.

DISPOSAL CONSIDERATIONS

Discharge, treatment, or disposal is subject to national, state, or local laws. Contract with a licensed chemical disposal agency. Since emptied containers retain residual product, follow label warnings even after the container is emptied.

USING TONER

Dilutions previously recommended for KODAK POLY-TONER can be used with this substitute toner.

—Toning Fiber Base Prints—

Step 1:

Tone prints in toner diluted 1:4 for approximately 1 minute at 21 °C (70 °F).

or

Tone prints in toner diluted 1:24 for approximately 3 minutes at 21 °C (70 °F). (This is the recommendation most commonly used.)

or

Tone prints in toner diluted 1:50 for approximately 7 minutes at 21 °C (70 °F).

Step 2:

After toning, rinse the prints in running water for about 2 minutes.

Step 3:

Treat the prints for about 3 minutes in a KODAK Hypo Clearing Agent solution (used only for this purpose) or in a sodium bisulfite solution containing 1 ounce per quart (30 grams per litre).

Step 4:

Harden the print emulsion by treating for 2 to 5 minutes in a hardening bath composed of 1 part KODAK Liquid Hardener and 13 parts water, or 2 parts KODAK Stock Hardener F-5a and 16 parts water. Hardening is required for adequate drying properties and does not affect the color and gradation of the print.

To make F-5a Hardener stock solution;
Begin with 600 mL water, at 50 °C (125 °F)

With stirring, add Sodium Sulfite (Anhydrous)	75.0 grams
Add 28% Acetic Acid	235.0 mL
Add Boric Acid, Crystals	37.5 grams
Add Potassium Alum, Fine Granular (Dodecahydrate); also known as Potassium Aluminum Sulfate Dodecahydrate, or AluminumPotassium Sulfate Dodecahydrate	75.0 grams
Add cold water to make	1.0 L

Step 5:

Wash prints for 30 minutes at 18.5 to 24 °C (65 to 75 °F). **Note:** All times indicated for KODAK Hypo Clearing Agent and washes are minimum times.

Step 6:

After washing, remove as much excess water as possible from the prints. Place them on cheesecloth stretchers, between clean, white photo blotters, or on a belt dryer. For high gloss with F surface paper, transfer the wet print to a heated glazing machine or ferrotyping dryer, or squeegee them into close contact with a chromium-plated ferrotyping sheet and allow to dry naturally.

—Toning Resin-Coated Prints—

Keep toning times and wash times to a minimum to prevent solution edge penetration and physical damage.

Step 1:

Tone prints in toner diluted 1:4 for approximately 1 minute at 21 °C (70 °F).

or

Tone prints in toner diluted 1:24 for approximately 3 minutes at 21 °C (70 °F). (This is the recommendation most commonly used.)

or

Tone prints in toner diluted 1:50 for approximately 7 minutes at 21 °C (70 °F).

Step 2:

After toning, rinse the prints in running water for about 2 minutes.

Step 3:

If hardening is necessary, harden the emulsion by treating for 2 to 5 minutes in a hardening bath composed of 1 part KODAK Liquid Hardener and 13 parts water, or 2 parts KODAK Hardener F-5a and 16 parts water. Hardening may be required for adequate drying properties, and does not affect the color and gradation of the print.

Step 4:

Wash prints for 4 minutes at 18.5 to 24 °C (65 to 75 °F). This will give adequate washing if prints are interleaved frequently. The use of the KODAK Automatic Tray Siphon offers an efficient means of washing in trays.

Note: Because of the rapid washing of resin-coated papers, KODAK Hypo Clearing Agent offers little advantage and is not recommended. Avoid prolonged washing in order to realize all the advantages of the resin-coated base, and to prevent physical damage.

Step 5:

Drying —Prints may be air-dried at room temperature. For fast, even drying, remove surface water from front and back with lintless blotters, a soft, viscose sponge, a cloth, or squeegee. Resin-coated prints **MUST NOT BE FERROTYPED.**

Prints may also be dried by circulated warm air or a hot air cabinet. Air or drum temperatures should not exceed 88 °C (190 °F).

Keep damp prints apart, and do not allow the emulsion to come into contact with any material. Low drying temperature will provide maximum dimensional stability, the least curl, and flattest prints.

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