

PHOTOGRAPHERS' FORMULARY SAFETY BULLETIN: HYDROXIDES

Hydroxides that are commonly used in photographic practice include Ammonium Hydroxide solution ($\text{NH}_4\text{OH}_2\text{O}$), Lithium hydroxide (LiOH), Potassium Hydroxide (KOH), and Sodium Hydroxide (NaOH)

Each of these chemicals, in solid or liquid form, is extremely caustic. Since caustic materials by definition are capable of dissolving protein, including animal tissue, one should understand the behavior of these materials and the proper techniques for handling them.

Solutions of the hydroxides, if spilled on the skin, will slowly dissolve it, and if splashed in the eye, can cause blindness in a short time. The dry material is hygroscopic, and will absorb water from the air or body to form a caustic liquid very readily.

IF HYDROXIDES CONTACT THE SKIN: Wash the area thoroughly with running water until the slipperiness is no longer present. Slipperiness is due to the hydroxide dissolving the skin. If desired, rinse with vinegar or working strength acid stop bath. Wash thoroughly. Treat damaged tissue as a burn.

IF HYDROXIDES CONTACT THE EYE (dry or wet): Place your head at once under running water (the sink is fine) and wash the eye for 5 to 10 min. Don't bother with eye washes, etc. Time is all-important. **WASH THE EYE FIRST**, then call a doctor at once.

To dissolve the hydroxide, simply stir the pellets into the solvent. It will dissolve very readily. It will not be necessary to pulverize the pellets or flakes. Large amounts of heat are liberated when hydroxides are dissolved, and if care is not taken, glassware may be broken or spattering may occur. It is prudent to dissolve a portion of the hydroxide, allowing the solution to cool before proceeding. Use cold or ice water when dissolving hydroxides.

Be sure to pick up all the pellets that accidentally spill. The solid material will pick up moisture from the air and in time, a very concentrated, very caustic solution forms. Dispose of hydroxide solutions by flushing down the sink or toilet with large amounts of water.

Since damage to flesh or eye can be serious, we strongly suggest the use of safety glasses and gloves when handling caustics. The use of beakers with handles is advantageous, as they are less likely to be dropped. The most important safety precaution is to take the time to move deliberately and carefully. Caustics should not be handled in the presence of children or pets.

All substances can be dangerous. Any material can be handled with safety if the correct precautions are followed. In many years of handling caustic solutions and other potentially hazardous chemicals, we have had no serious difficulty, and with a reasonable amount of care, you need have no problems. We counsel respect, but not fear.

FORMULARY PARAMINOPHENOL FILM DEVELOPER (RODINAL TYPE)

Formulary Paraminophenol is a p-aminophenol hydrochloride film developer that is economical and excellent for slower speed films (ASA 32-200). Unless graininess is desired, Formulary Rodinal is not recommended for faster films. Formulary Rodinal produces very good sharpness, high acutance and fine grain when used to develop modern, ultra fine-grain emulsions. The contrast is variable and depends upon dilution and development times. The chemicals in the kit are used to prepare a stock solution, which is diluted 1:50 or 1:100 to yield up to 100 liters of working solution. The shelf life of the stock solution is six months. The working solution is used once and then discarded.

Because the developer is used at very high dilution, it has a compensating action that prevents blocked highlights and brings out shadow detail.

CHEMICALS CONTAINED IN THIS KIT

Your chemicals will contain the following chemicals:

Chemical	Kit Size	1/4 liter	1/2 liter	1 liter
P-aminophenol hydrochloride		12.5 g	25 g	50 g
Sodium Metabisulfite		37.5 g	75 g	150 g
Potassium Hydroxide		53.7 g	107.0 g	215.0 g

CHEMICALS SAFETY

All chemicals are dangerous and must be treated with respect. One chemical in this kit needs special attention:

POTASSIUM HYDROXIDE, like sodium hydroxide, is a dangerous chemical, since it is a corrosive and if spilled on the skin will cause a chemical burn. Its action is insidious because the burn occurs without pain. Wash your hands frequently without soap, so that if you detect a soapy feeling while washing potassium hydroxide is present. If so, wash thoroughly with soap and water. Pellets of potassium hydroxide are easily spilled during solution preparation. If spillage occurs outside of a sink, all of the spilled solid must be cleaned up. Use a damp disposable towel. If the solid is not cleaned up it will absorb the moisture from the air and form a puddle of very caustic hydroxide that will not evaporate.

The proper technique for preparing your solution is described in the mixing section. We strongly urge you to wear both safety glasses and rubber gloves when working with this particular chemical and its solutions.

The user assumes all risks upon accepting these chemicals.

IF FOR ANY REASON YOU DO NOT WISH TO ASSUME ALL RISK, PLEASE RETURN THESE CHEMICALS WITHIN 30 DAY FOR A FULL REFUND.

MIXING THE SOLUTIONS

Two initial solutions will be prepared then combined to make the stock solution. The working solution is prepared by dilution of the stock solution just prior to use. To mix these solutions you will need two mixing containers (one of which should be plastic), a plastic spoon and a graduated cylinder or other volume-measuring device. Both initial solutions will be combined into one of the mixing containers to make the stock solution; therefore, be sure that one of the containers is large enough to hold the combined volumes of both solutions.

Initial Solution A

Chemical	Kit Size	1/4 liter	1/2 liter	1 liter
Distilled Water (120F/49C)		156 ml	312 ml	
625 ml				
P-aminophenol hydrochloride		12.5 g	25 g	50 g
Sodium Metabisulfite		37.5 g	75 g	
150 g				

Boil the water just prior to use in order to degas it and minimize the initial oxidation of the p-aminophenol, or use distilled water. The water should be allowed to cool to 120 F/49 C before mixing is attempted.

Place the warm water in the larger of the two mixing bowls and add a pinch of sodium Metabisulfite. Like boiling, a pinch of the Metabisulfite minimizes the initial oxidation. Add the p-aminophenol hydrochloride and stir the solution to dissolve the solid. After the solid has dissolved, add the bulk of the sodium Metabisulfite and, again, stir the solution to dissolve the solid. DO NOT add additional water to this solution.

Initial Solution B

Chemical	Kit Size	1/4 liter	1/2 liter	1 liter
Water (16 C/61 F)		125 ml	250 ml	500
Potassium hydroxide		53.7 g	107.0 g	215.0 g

Initial Solution B must be prepared in a sink and in a well ventilated area. Place a dry, wide-mouth plastic mixing container of the appropriate size in a sink and place the solid potassium hydroxide in the container. Measure the proper volume of cold water and carefully add the water to the plastic container.

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Stir the mixture with a large plastic spoon until the solid has gone into solution then let it sit in the sink until it reaches room temperature.

When potassium hydroxide goes into the solution considerable heat is generated. If the water isn't cold enough the solution may begin to steam. If this should occur add some ice to cool the solution. If you cannot cool the solution, leave the room and let it cool off by itself. After the solution has cooled, then proceed. DO NOT BREATHE THE VAPOR -- it contains entrapped potassium hydroxide.

STOCK SOLUTION

To Solution A, slowly add with stirring, small portions (5 to 10 ml) of Solution B. A total of about 45 ml (90 or 180 ml depending on kit size) will be required.

When the first portions of Solution B are added a precipitate will form in Solution A.

As more Solution B is added, the precipitate will begin to dissolve. The objective is to add just enough Solution B to dissolve most, but not all, of the precipitate. A small amount of precipitate must remain in the final solution to ensure the alkalinity of the final developer is not too great. As you approach the final point, add less and less of Solution B in each portion (1-5 ml). Be sure to stir the solution thoroughly.

After almost all of the precipitate has been dissolved, add sufficient water to the solution to bring the final volume up to 250, 500 or 1000 ml, depending on kit size. Occasionally, additional precipitation will occur when the water is added. Should this happen, add additional Solution B to dissolve most of the precipitate. Finally, transfer the solution to a storage bottle. Storage in several small bottles is superior to storage in one large container.

An excess of potassium hydroxide has been provided in your kit. Therefore, not all of Solution B will be needed to prepare the Stock Solution. Check with local sewer and water authorities regarding disposal of darkroom chemicals. Discard the excess Solution B down a sink drain with copious amounts of water. Clean both the inside and outside of the Solution B container thoroughly.

USING THE DEVELOPER

Dilution and Development Times

Dilution of the Stock Solution to make the working solution, development time, and the contrast desired are interrelated and determined, in part, by the speed of the film being processed.

The following dilutions and development times are to be taken only as starting points. The exact dilutions and times will depend upon your personal method of agitation and contrast requirements, and will have to be determined in your darkroom.

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DEVELOPMENT TIMES

Develop the film at 20C/68F. Regardless of film type, for normal contrast, develop the film for 12 minutes.

For increased or decreased contrast, develop for 12-15 minutes.

Typical Processing Run

Develop: 12 minutes for normal contrast or 12-15 minutes for increased or decreased contrast

Stop: 30 seconds

Fix: 2-4 minutes with Formulary TF-4 Rapid Fix (Cat. No. 03-0141).

Wash: 30 seconds

Clear: 2 minutes using Formulary Hypo Clear (Cat. No. 03 -0165).

Wash: 5 minutes in running water.

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Slow Films (such as Plus X or FP4).

Approximate Volume of the Working Solution Desired Chemical

	500 ml	1000 ml
For Normal Contrast		
Stock Solution	5 ml	10 ml
Water	500 ml	1000 ml
Working Solution	505 ml	1010 ml
For Increased Contrast		
Stock Solution	6.5 ml	13 ml
Water	487.5 ml	975 ml
Working Solution	494 ml	988 ml
For Reduced Contrast		
Stock Solution	3.5 ml	7 ml
Water	500 ml	1000 ml
Working Solution	503.5 ml	1007 ml

Fast Films (such as Tri X or HP4).

Approximate Volume of the Working Solution Desired Chemical

	500 ml	1000 ml
For Normal Contrast		
Stock Solution	6.5 ml	13 ml
Water	487.5 ml	975 ml
Working Solution	494 ml	988 ml
For Increased Contrast		
Stock Solution	10 ml	20 ml
Water	500 ml	1000 ml
Working Solution	510 ml	1020 ml
For Reduced Contrast		
Stock Solution	5 ml	10 ml
Water	500 ml	1000 ml
Working Solution	505 ml	1010 ml

