Rhodamine 6G
#A-26481

TECHNICAL INFORMATION

INTRODUCTION
Rhodamine 6G is a fluorescing dye useful in the enhancement of latent fingerprints developed with cyanoacrylate fuming. It is especially effective on surfaces with confused backgrounds that makes it difficult to visualize ridge detail under normal lighting. Rhodamine 6G is suitable for field and lab use. It does not function well on highly fluorescent backgrounds, and it may be absorbed into some substrates causing them to be highly fluorescent. Rhodamine 6G is available only as a powder concentrate.

PRECAUTIONS
- Before using this kit, consult the appropriate Safety Data Sheets (SDS)
- Wear protective latex gloves and clothing, including protective eyewear, when preparing or using Rhodamine 6G.
- Rhodamine 6G solution is toxic, and it should be mixed and used in a fume hood, in an area with adequate ventilation, or with an appropriate respirator.
- Extinguish all smoking materials and open flames before using the methanol formulation.

BACKGROUND
In recent years, spectacular results have been achieved in the enhancement of latent prints through the use of fluorescent reagents in combination with alternate light sources (ALS). Rhodamine 6G combines chemically with polymerized cyanoacrylate prints to form compounds that fluoresce under ultraviolet (UV) light. Viewing must be in a darkened room, and the resulting print will be seen to glow against a dark background. Rhodamine 6G should only be used on prints that have been developed using cyan oacrylate-fuming techniques. For detailed information on cyanoacrylate fuming, see the technical information supplied with the individual cyanoacrylate products. Because of their translucent, whitish appearance, developed cyanoacrylate prints generally require enhancement before they can be successfully recorded. Rhodamine 6G may be brushed onto the developed prints, or the surface containing the prints may be immersed in the solution. Regardless of the method of application, allow at least one minute for the dye to set. Rhodamine 6G enhanced prints may be visualized using longwave UV light or with blue light illumination.

PROCEDURE
Creating a Working Solution
NOTE: Methanol adds to the toxicity of the formulation. Methanol is highly flammable. The following formula makes 1000ml. of solution.
1. Place 0.1g (approximately 1/4 teaspoon) of Rhodamine 6G powder concentrate into a clean vessel capable of holding at least 1000ml. of liquid.
2. Place 1000ml. of methanol or distilled water into a second clean vessel.
3. Slowly pour the methanol (or distilled water) into the vessel containing the Rhodamine 6G powder concentrate while stirring the solution.
4. Continue to stir the solution until all of the powder is dissolved.
5. The working solution may be transferred to smaller containers to simplify use. Label the containers with the name 'Rhodamine 6G Working Solution." Include the date of preparation on the label.
NOTE: Working solutions remain effective up to one year.

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Application of Rhodamine 6G
Rhodamine 6G does not perform well on highly fluorescent backgrounds and may be absorbed into some substrates causing them to become highly fluorescent. Test an area of the substrate free of developed prints before attempting to enhance developed prints. If the test area is found to fluoresce after being thoroughly rinsed and dried, do not use Rhodamine 6G to enhance the prints.

Immersion Method
1. Submerge each item in the working solution for approximately one minute.
2. Allow excess working solution on the items to drain back into the working solution tray.

Spray Method
The spray method should not be used due to the risk of inhalation.

Brush Method
Using a soft bristle brush, paint the item repeatedly with working solution. Special Notes : After application of Rhodamine 6G, and allowing at least one minute for the dye to set, rinse each item thoroughly under running water. Air dry each item completely.
Keep unused solution in a tightly sealed container.
When fuming with cyanoacrylate, it is strongly recommended that you underdevelop latent prints rather than overdeveloping them. This is especially true when you intend to enhance the prints with Rhodamine 6G. Excess residue from over-development tends to fill the valleys between the ridges causing dye staining to be ineffective.

Visualization
Rhodamine 6G is a fluorescent reagent and appropriate equipment is required to view the developed print. Excitation can be accomplished with longwave UV sources, blue light sources, tunable forensic light sources, and lasers. Blue, green or red illumination produces the best overall results. Follow all safety recommendations for the light source you choose. If using a light source other than longwave UV, viewing must be through an appropriate barrier filter such as the orange filter supplied with a blue light system. NOTE: If illumination is provided by a red ALS (625nm), use a red barrier filter.

Recording the Evidence
Video and film cameras may not exhibit spectral sensitivity identical to the human eye. Put another way, what you see you may not get. As a consequence, it is difficult to develop hard and fast rules for the use of these instruments in recording fluorescence. It is possible, however, to develop general rules for fluorescence photography.

▪ Use of Light Meters—Unless you are fortunate enough to have a highly specialized spot meter, you will find that normal hand-held or in-camera light meters are of no use in fluorescence photography. Do not rely on the camera's automatic mode or upon recommendations that its light meter may offer. Use bracketing techniques, and expect exposure times of a half-minute or longer.

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▪ Steady the Camera—Because of the extremely low light levels involved with fluorescence, photography involves long exposures. Photography must be done with the camera mounted on a sturdy tripod. The room should be totally dark or you must use a light-tight enclosure.

▪ Illumination T echniques—The only illumination present must be from a blue or suitable UV light. Stray light must be eliminated and illumination must be as even as possible. Good practice suggests that you "paint" the light onto the surface being photographed by moving the illumination spot around during exposure. This will tend to even out the illumination over the period of the exposure.

▪ Fill The Frame —Fluorescence intensity falls off with distance so it is important to position the camera as close to the subject as possible while filling the viewfinder frame with the image. If you use a commercial lab for film processing, allow a 20% border around the subject to allow for the lab's cropping of the photos.

▪ Use a Barrier Filter— A barrier filter on the camera is necessary because of the same reason you needed one for your eyes. If you are using standard UV light sources, equip the camera with a UV17 or Haze 2A filter. NOTE: Use an orange barrier filter for blue or green ALS and a red barrier filter for a red ALS.

▪ We recommend filters specifically designed for use with your camera. Please note that some commercially available filters may fluoresce weakly themselves when exposed to the ALS beam. This will result in hazy or foggy photos. Specify non-fluorescing threaded filters or Cokin®-type sheet barrier filters available from your local camera distributor.

▪ Films—All films are sensitive to blue light. If a barrier filter were not used, the blue light would overpower the fluorescence and mask it. In this application daylight films are superior to specialty films such as tungsten or similar light compensated films. Daylight films generally have red, green, and blue layers of equal sensitivity. Tungsten films are manufactured to be especially sensitive to blue and are not suitable for UV photography.

▪ Use the highest speed film you can find. Reduce the effect of graininess by filling the frame, thus reducing the enlargement factor. Use a large format camera for the same reason. Black and white films are excellent for recording fluorescence due to their high speed and relatively fine grain. A barrier filter is still necessary with black and white film.

▪ Aperture Settings—The camera's aperture setting controls the size of the opening in the lens iris and thus controls the amount of light reaching the film. Because fluorescence is weak you may be tempted to open the aperture as wide as possible to reduce exposure times. But keep in mind that the aperture also controls depth of field or depth of focus. Use of a small aperture means sharpest focus over an extended object. Focus is especially critical when photographing at close range. We recommend using longer exposures and smaller apertures (f/8 to f/22).

▪ Reciprocity Failure—If you experiment with the relationship between the amount of light present from a scene, the length of time that the camera shutter is open, and the density of the exposure created on film, you find that for normal photography, a simple relationship exists: Exposure = Light Intensity x Time. When exposures are long or light intensities are either very low or very high, this relationship fails to hold together. This is known as reciprocity failure. The consequences of this in fluorescence photography are seen in color shifts, and in a general decrease in film speed. Color shifts can be compensated for with color-compensating filters if it is felt necessary (consult photography texts for assistance). It will also be found that camera settings no longer scale in a linear fashion (i.e., doubling the aperture size or exposure time does not double the density of the exposure). What all of this leads up to is that fluorescence photography is an art.

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Keeping Records
Successful fluorescence photography requires practice, experience, and patience. As you gain experience your judgment of exposure times will certainly improve. The learning curve can be greatly reduced if you record your experiences in a notebook. The data worth recording includes the subject being photographed, aperture settings, film used, and exposure times. Be sure to include a copy of the resultant photograph.

Starting Point
The table to the right was developed to provide a starting point for your photographic efforts.

Using Digital Camera Equipment
Digital photography is rapidly replacing the use of film cameras. Among the may advantages digital equipment offers to the law enforcement photographer are:
1. The LCD screen provides instant viewing of the photos taken.
2. Portable digital printers permit quick printouts of photos at the crime scene.
3. All photo records can be stored on a computer and easily accessed.
4. Pricing is now within the range of most agencies.

Digital cameras are used in the same manner as film cameras in that they are available with adjustable settings for ISO/ASA, shutter speeds, and aperture settings. Using the suggested starting points given above for film cameras, the evidence photographer can instantly see if the proper settings were used. We recommend that the digital camera be set up for an ISO/ASA of 100. Most digital cameras offer a range of quality settings. Use the highest quality setting available. For crime scene use, we recommend a high resolution camera NOTE: Be certain to include a scale in all photos taken.

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