Technical Report

A Simple Three Dye Blend

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Introduction

The use of three dye blends is a versatile way of applying fluorescent dye staining techniques on a c yanoacrylate developed surface. Three dye blends excel over conventional dye staining techniques on multicolored surfaces and objects that are composed of several different substrates, because dye adhesion to a cyanoacrylate developed print can vary according to the particular dye utilized. In addition, excitation wavelengths that are effective with a particular dye may also cause the substrate to fluoresce. Such background fluorescence can mask the luminescence of one dye, whereas changing the wavelengths for the other dyes in the blend may eliminate this background interference.

Many three dye blends involve multiple solvents, time-consuming preparations, and expensive dye components. A procedure utilizing three dye blends was sought that could be performed routinely, with a minimal amount of time and cost.

A relatively easy three dye blend can be prepared with the use of one solvent, either isopropyl alcohol or denatured ethanol, and the use of Ardrox's P- 133D, Rhodamine 6G, and Basic Yellow 40. These three dyes were selected because each is excited at different and distinct wavelengths. Ardrox P-1 33D achieves peak excitation at 365 nm, while Basic Yellow and Rhodamine 6G produces best results at 425 nm and 515 nm, respectively.

Dye Preparation

To prepare one liter of dye solution, approximately 940 ml of either isopropanol or denatured ethanol (reagent grade not necessary) are measured and poured into a suitable container. One gram of Basic Yellow 40 is added to the solvent, and mixed until dissolved. To this, 0.1 grams of Rhodamine 6-G are added, and the solution is stirred. Finally, 8 ml of Ardrox's P- 133D are mixed into the dye solution. Although this prepared three dye solution will work quite well as is, the optional addition of 50 ml of acetonitrile will increase the brilliance of the luminescense. Acetonitrile, however, does increase the health and safety risk.

Procedure

All dye staining should be performed in a fume hood. Those performing dye staining need to wear appropriate personal protective equipment and clothing.

One method of applying the three dye blend is by dipping the cyanoacrylate fumed evidence in a tank containing the dye, and allowing the evidence to remain in the tank for one minute. Then the evidence is thoroughly rinsed under running tap water.

A second method is the use of a laboratory wash bottle in which the dye solution is squirted over the surface of the evidence until it is uniformly covered. The dye is allowed to remain on the object until most of the solvent odor has dissipated (usually 30 seconds to one minute). The evidence is then rinsed under running tap water.

Regardless of which method is used, the evidence should remain in the running fume hood to accelerate the drying process. A hot-air hair dryer could also be used to shorten the drying time. When the dye stained surface is completely dried, the evidence is then examined with a UV light source. The examiner should wear yellow tinted UV protective glasses to aid in the examination.

This initial examination may be facilitated by the use of a fluorescent desk lamp that utilizes two 18" fluorescent tubes in which the fluorescent tubes have been replaced with two black light bulbs [1]. This works best in a partially darkened room. Usable prints can be circled or otherwise marked with a fluorescent grease pencil. After the initial examination, usable prints are then photographed with excitation from a high intensity UV light, such as Spectroline's SB-1OO.

If no latent prints are revealed by UV excitation, or if revealed latent prints are partially obscured by background fluorescence or display a lack of contrast, an alternate light source is then used to continue the examination. The examiner should then wear orange protective goggles while changing wavelengths above 445 nm. An alternate light source with numerous wavelength filters, such as the Crime Scope™, could be used.

The evidence is then viewed with the appropriate wavelengths, and any usable latent prints that become visible are photographed. Although the same latent prints may luminesce by excitation from several or all wavelengths, improved contrast or elimination of background fluorescence at a particular frequency is often obtained.

Observations

Repeated experimentation and applications by the author of latent print detection using dye staining have resulted in some general observations that should be noted. Any latent print that becomes visible and appears to have sufficient ridge detail as the result of cyanoacrylate fuming should be photographed prior to the dye application. The author has observed, on several occasions, that a latent print disappeared after dye staining and rinsing.

The author also wishes to stress that, in some instances, latent prints with insufficient detail under a UV light were enhanced and photographically captured using wavelengths from an alternate light source and, conversely, latent prints not usable with an alternate light source could be seen with an high intensity UV light source. All available excitation sources should be attempted for a thorough examination.

There is a special note of caution when using any dye staining formula, especially on color printed surfaces. Alcohols, along with other solvents, can rinse away some coloring matter, resulting in distruction of the latent print. A similar surface should be tested with the dye stain solution before processing any evidence where there may be the potential for solvent damage. If a similar surface is not available, a spot test in an area of the surface least likely to contain latent prints may be attempted. If surface damage occurs, other procedures or alternative formulations must be considered.

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References

1. McCarthy, M. M., "Evaluation of Ardrox as a Luminescent Stain for Cyanoacrylate Processed Latent Impressions", *Journal of Forensic Identification, 40(2), 1990,* pp 75-80.