An Alternate Solvent System

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Introduction

Ardrox fluorescent dye penetrant P-133D has already demonstrated its unique ability to enhance faintly developed latent prints with the aid of a high-intensity, longwave, UV light source.[1] This capability has enabled law enforcement agencies to develop difficult latent prints without paying the high cost of laser or alternate light sources.

Upon evaluating published Ardrox stain formulations, researchers concluded that Freon, perhaps the best solvent system[2] but faced with elimination from the commercial market by escalating costs, should be replaced by a safer, alternative carrier solvent system. They then set out to develop such a system.

Basic solubility tests on Ardrox P-133D stain with certain solvents—including alcohols—showed that (a) 2-propanol (isopropyl alcohol) was an excellent solvent for the Ardrox stain, and (b) methanol was a poor solvent.

Procedure Preparation

Before any dye staining solution is applied, the nonporous items to be processed—plastic bags, metal coin boxes, guns, etc—must first be fumed properly with cyanoacrylate vapors.[3] Overfuming will result in a buildup of polymerized cyanoacrylate on the print as well as on the background surface, which causes the dye to adhere to the background material upon which the print is deposited. The best insurance against overfuming is to check your process with a test print in the fuming chamber before having to do the real thing. When the test print appears developed, stop the fuming process and open the chamber.

Based on evaluation of various experimental formulations, a one percent (1%) solution of P-133D in isopropanol plus the addition of five percent (5%) acetonitrile gave the best results. The acetonitrile can be eliminated, but there is a slight observed reduction in the brilliance of the fluorescing fingerprint.

Procedure

The dye solution can be applied by either spraying, dipping, or swabbing with cotton balls. Although the P-133D is a relatively safe dye penetrant, and isopropanol is not as hazardous as methanol, rubber gloves should be worn when processing; and processing should be performed in a fume hood, as with any chemical technique.

After the solvent odor of alcohol has disappeared (approximately one minute), wash the dye-stained item (plastic bag, gun, etc) by immersing it under running tap water for at least 30–60 seconds. Do not rinse with any other solvent at this time because stronger solvents could wash the dye off a faint latent print.

If the wash water has high mineral content, spray the washed surface with distilled water from a spray bottle. Spraying with distilled water reduces the chance of mineral stains across a faintly developed print. Allow the dye stained items to dry; either suspend them to air dry or force-dry them with a hair dryer or other heated air device.

Examine the items under a UV light source in a partially darkened room. The most effective UV lights have a 100W mercury vapor lamp as an energy source, such as

Spectroline SB-100. For eye protection, wear a pair of yellow- or orange-tinted UV goggles when performing the examinations. Orange and yellow tints eliminate some undesirable background fluorescence.

A hand-held magnifying glass and a fluorescent grease pencil or crayon are also helpful in the complete search of the item for usable prints. Circle all usable latent prints with the grease pencil or crayon. After the item is completely searched, then photograph usable prints.

If ridge detail is absent and dye adheres to the background, then rinse the surface with an isopropyl alcohol wash, and allow the item to completely dry, either by forced air with a hair dryer or air-drying overnight. Thorough drying is very important because traces of water will be held by the CA-developed print and will prevent the dye from being absorbed. A second dye staining at this time will often reveal more detail because the alcohol will often remove background contaminants without affecting the CA print. There have been significant cases reported where a gentle alcohol wash with cotton balls saturated with alcohol, followed by drying, re-staining, and rewashing yielded a usable print.

Photography

Either color or black-and-white film can be used to capture the yellow-green fluorescing fingerprints. Use a KODAK WRATTEN Gelatin Filter, No. 2B or 2E in front of the camera lens to reduce UV reflectance. Background fluorescence, which can emanate from many sources, such as brightly colored beverage cans, can be eliminated with the use of a KODAK WRATTEN Gelatin Filter No. 58 in front of the camera lens. The No. 58 (green) filter allows light of a wavelength similar to the emission wavelength of Ardrox P-133D stain to pass through the filter while blocking the fluorescence from the blue-to-orange-to-red region.

Suggested black-and-white films for photographing dyed items are KODAK Technical Pan Film, KODAK T-MAX 100 Film, and KODAK T-MAX 400 Film. KODAK DEKTOL Developer will give excellent results when used to develop the above films. DEKTOL Developer increases the contrast index of the films and requires a short development time (3 minutes at 68°F). Kodak literature also states that DEKTOL Developer changes Technical Pan Film's speed to ISO (formerly ASA) 200.

Due to caseload size and the need to save time, all fluorescent latent prints are photographed one-to-one (1:1). Resulting negatives are used for direct comparison with other like negatives, and the ridges will appear uniformly black and similarly sized on the negative.

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References

1. McCarthy, Mary M., "Evaluation of Ardrox as a Luminescent Stain for Cyanoacrylate Processed Latent Impressions," *Journal of Forensic Identification*, **40**(2), 1990, pp 75–80.
2. Miles, C., "Analysis of Ardrox 970-P10 Liquid Penetrant," Field Identification Resource Section Report #001, Ottawa, Ontario, 1987.
3. Olenik, J. H., "Super Glue—A Modified Technique for the Development of Latent Fingerprints," *Journal of Forensic Identification*, **29**(3), July 1984, pp 881–883.