Technical Note

Dye Staining of Duct Tape: An Overlooked Procedure

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Abstract: By changing the carrier solution of the popular dye basic yellow 40, one is able to develop latent prints on problematic surfaces such as the adhesive side, as well as the smooth side, of duct tape. The tape has to be properly fumed with cyanoacrylate vapors before the dye is applied. After dying, the tape is aggressively rinsed, followed by drying. The developed prints are f luorescent under blue light as well as under a forensic light source in the 415 nm to 485 nm range and viewed with yellow or orange goggles. These prints are easily photographed.

Introduction

After years of experimenting with different solvents for traditional f luorescent dyes like Ardrox [1], rhodamine 6G, and others, I decided to evaluate the f luorescent dye basic yellow 40 (also known as panacryl brilliant f lavine 10GFF and yellow brilliance) to determine whether changing the solvent that is normally used to dissolve the dye would generate better results with problematic surfaces such as the sticky side of duct tape. As a result, I learned that denatured alcohol (reagent grade denatured ethanol, denatured with 5% methanol and 5% isopropanol) or even the commonly available Klean Strip Green Denatured Alcohol [(W. M. Barr & Co., Inc. Memphis, TN), which is 90% ethanol and a blend of denaturants] worked slightly better than methanol (common solvent for many dyes), but I noticed that some coating of the background on the adhesive

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Procedure

Duct tape containing possible latent prints should be properly fumed with cyanoacrylate vapors [2] (super glue) first. If the tape is waded up or folded, preventing the cyanoacrylate fumes from penetrating the tape, it should be frozen with liquid nitrogen [3], taken apart and re-fumed. Basic yellow dye is prepared by making a 0.2% solution in denatured ethanol, which is 0.2 grams of the powdered dye per 100 mL denatured alcohol. Through years of use, I learned that 0.2% is also a saturated solution, and to make the correct concentration, without weighing, just add a very small amount of the powdered dye to the alcohol until no more dissolves. This requires you to stir the solution after a small amount of dye is added and dissolved, and repeating until a trace amount remains at the bottom of the clear glass container; this will take several minutes. The dye is now ready to use for most surfaces, but for duct tape you must add water to the resulting solution to make it contain 25% water. For example, if you make 500 mL of dye solution, you must add 125 mL of water. This is a relatively safe dye, but follow laboratory safety procedures, including chemical-resistant gloves. The best developing technique is to use a tray where you can immerse the pieces of duct tape in the dye solution. Allow the tape to remain submerged in the staining solution for no less than 1 minute. Remove the tape and rinse under running tap water until no more dye is seen. Dry the tape with the air flow of a fume hood or with an air dryer at a low temperature setting. The fluorescence of basic yellow 40 is best observed when illuminated with light of wavelength 445 nm (Figure 1), but illuminating with most blue light wavelengths (e.g., those wavelengths between 415 and 485 nm) will also work.

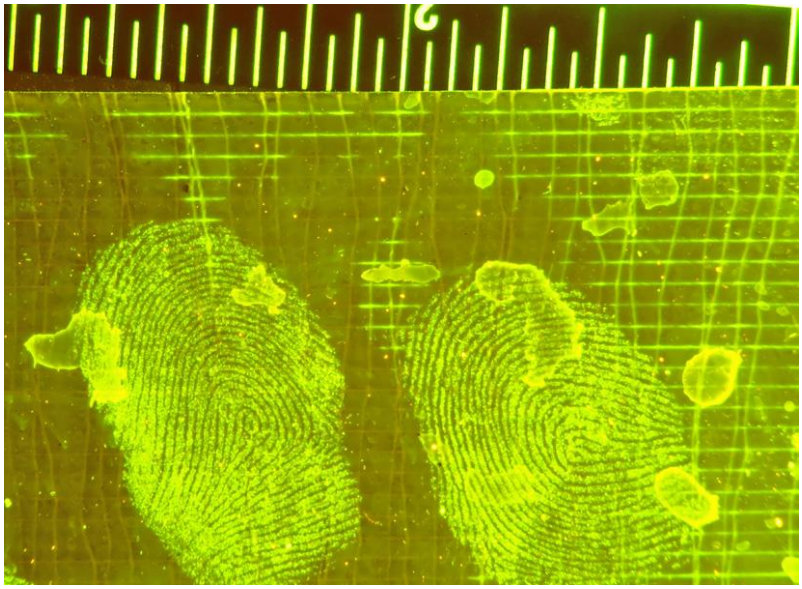

Figure 1

These prints were developed on the sticky side of duct tape after processing with CA fuming and using the described basic yellow technique, exciting the prints with a Spectroline LED blue light model TRI-450 (Spectronics Corp., Westbury, NY), and using a generic orange filter in front of the camera lens.

Conclusion

Duct tape is frequently encountered at crime scenes and most examiners were limited to the techniques they could use, because most techniques could only be used on one side of the tape. This process not only works on the sticky and smooth side of duct tape but also on other plastic tapes, including black electrical tape.

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