

# Blood Reagents on Dark Surfaces

Enhancing blood detail on dark or multi-colored surfaces have always presented a challenge. There have been several chemical reagents developed to help with that problem. Common chemical reagents available when needing to enhance visible and latent blood detail are acid yellow-7 and leucocrystal violet (LCV). Phloxine-B, not as common as LCV and acid yellow-7, is also marketed as a dark or multicolored surface blood reagent.

The chemical's application, versatility, and ability to visualize blood detail were compared as each chemical reagent was used on various dark and multi-colored surfaces. The results of this comparison will allow for the proper use of the most effective chemical blood reagent depending on the surface and situation.

Acid yellow-7 enhances blood by causing protein in blood to fluoresce yellow when exposed to an alternate light source. This reagent has a multi step application process that requires the surface to first be fixed using a sulfosalicylic acid solution, then a reagent application followed by a rinse step. This reagent has been found to be extremely effective in developing and enhancing visible and latent blood detail.

Phloxine-B reacts with the protein in blood resulting in a visible pink-red color. This reagent will also fluoresce when exposed to an alternate light source resulting in an orange-red color. This chemical has a one step application.

LCV may not be the first reagent of choice when working with a dark or multi-color surface due to the resulting purple-blue color development of the blood but this chemical reagent can fix and enhance blood detail in one step. The resulting chemical color reaction can be observed and photographed using visual light and normal photography lighting techniques. Also research has found that LCV will fluoresce yellow to red in color when exposed to a laser light and some alternate light sources.

#### Methods:

Several dark surfaces were collected to be sample surfaces: black plastic bag, black vinyl, black marble laminate tile brown vinyl and brown laminate tile. These surfaces are common examples of non-porous surfaces that are frequently encountered.

Blood was obtained from the researcher and stored in purple topped tubes containing EDTA. Blood was applied to the finger by use of a blood soaked tissue. All blood evidence was allowed to dry on the sample surfaces prior to processing.

#### Preparation:

Acid yellow-7 and LCV preparation and application was done in accordance with the policies of the Kansas Bureau of Investigation. Phloxine-B was prepared and applied according to the manufacturer's instructions.

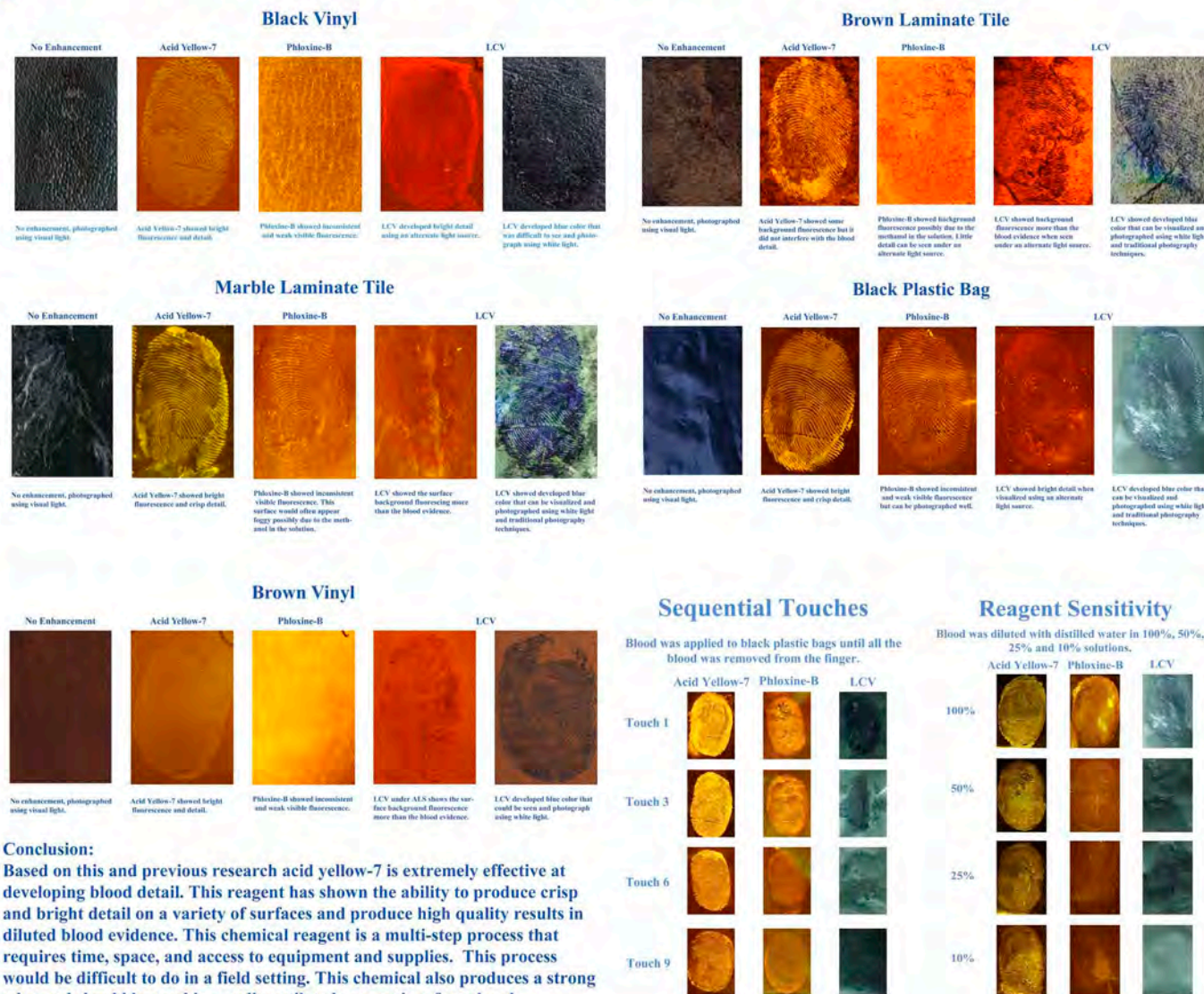
Crimescope CS-16-500 was used in visualizing surfaces processed with Acid Yellow-7 and Phloxine-B. Variety of wavelength was employed depending on the surface. Generally 475-525 nm was used to visualize the Acid Yellow-7 and LCV and 475-515 nm was used for in Phloxine-B. Orange barrier goggles and filters were used to examine and photograph surfaces.

TracER laser light was also used to visualize surfaces processed with LCV. Orange barrier goggles and filters were used to examine and photograph surfaces.

Note: All examination and photographs conducted using the TracER laser were used as a control and base for comparison. For consistency, all three reagents were tested and the resulting photo documentation was produced using the Crimescope CS-16-500.

Safety/Limitations: All of these reagents are hazardous chemical solutions. All proper personal protection equipment should be worn at all times when utilizing these reagents. Proper ventilation is extremely important and when possible reagents should be used under a fume hood. Eye safety goggles should be worn at all times when using any type of alternate light source or laser light.

Phloxine-B is made with methanol. This solvent can destroy some surfaces such as painted or varnished exteriors and should not be used. At this time the researcher is unaware if there is a water based solution available.



#### Conclusion:

Based on this and previous research acid yellow-7 is extremely effective at developing blood detail. This reagent has shown the ability to produce crisp and bright detail on a variety of surfaces and produce high quality results in diluted blood evidence. This chemical reagent is a multi-step process that requires time, space, and access to equipment and supplies. This process would be difficult to do in a field setting. This chemical also produces a strong odor and should be used in a well ventilated area or in a fume hood.

Phloxine-B was found to be inconsistent in both fluorescence and the ability to develop detail. It was extremely important to agitate the solution immediately prior to use to increase the fluorescent intensity. This reagent should not be used on painted or varnished surfaces due to the methanol solvent. Fixing the surface with a sulfosalicylic acid solution can impede the surface fogging caused by the methanol. The single application, applied using a spray bottle, should be used in well ventilated area or in a fume hood. This reagent is able to be used in both a field and lab setting.

LCV did not develop as clearly on dark surfaces but could still be seen using visual white light. On many of the surfaces the blood detail could be easily photographed with traditional and common photography techniques. Using a laser to cause a fluorescence may be inconvenient in that lasers are expensive and the accessibility to a laser can be difficult. Some alternate light sources have the ability to create fluorescence with LCV and it was found that the intensity of the fluorescence increased over time. In some cases "fluorescence" may not have been created but the alternate light source assisted in visualization of the blood detail on the surface. This reagent does have its advantages in that it fixes the blood detail and enhances it in one step and can be easily used in a field and lab setting.

Overall this researcher found that acid yellow-7 was superior to the other two reagents in clarity, sensitivity, and fluorescent intensity. This reagent does have limitations specifically in that it would be difficult to apply in the field or on large cumbersome objects. LCV was found to be the best of the three reagents tested to be used in the field due to the easy of application, results of the development and its fluorescent ability. Phloxine-B was found to be inconsistent in detail development and fluorescent intensity. More research would be needed to be conducted before it would be recommended to Phloxine-B in case work.