

Protocol Development: Lumicyano™ Use for Developing Latent Fingerprints



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Introduction

Cyanoacrylate ($C_6H_7NO_2$) is commonly used to develop latent fingerprints¹. The main components of a latent print are sweat, amino acids, fatty acids, and proteins. Cyanoacrylate reacts with these components to make the fingerprint visible so it can be photographed. For this to occur, the cyanoacrylate must be vaporized. The vaporization takes place in an airtight container with a heater. Drops of the cyanoacrylate are placed in a foil container on the heater. When the cyanoacrylate boils, the gaseous form moves into the air where it reacts with the fingerprint components². When vaporized, cyanoacrylate is polymerized. The polymerization of cyanoacrylate occurs with an anionic catalyst and weak bases. Polycyanoacrylate, the white solid, is formed on the fingerprints¹.



Figure 1. Lumicyano™³.

Lumicyano reacts in the same way as cyanoacrylate does. Lumicyano allows for the fumes to be fluorescent and achieve a detailed fingerprint to be viewed under forensic lighting⁴. Lumicyano has two components, the Lumicyano Solution and the Lumicyano Powder. These components must be combined for the fuming process⁴. Lumicyano is able to develop fingerprints on semi-porous and non-porous surfaces like plastic, metal, and glass⁴.



Figure 2. Print Developed with Lumicyano™.

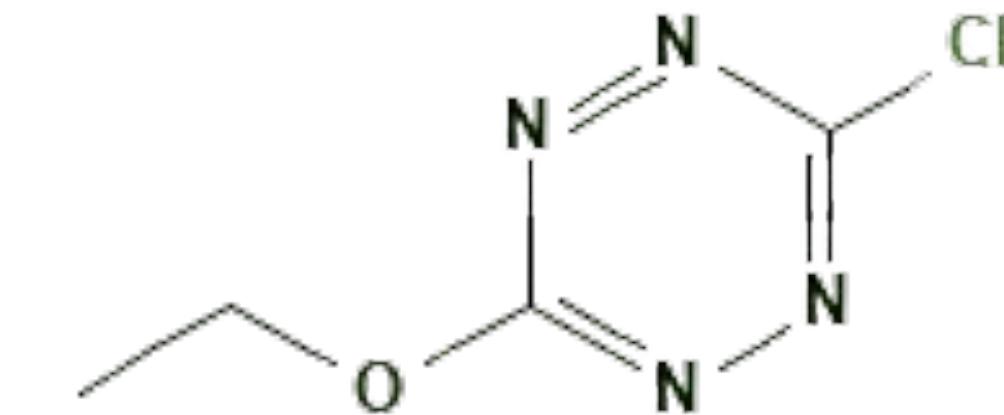


Figure 3. Structure of Fluorescent Compound in Lumicyano™⁵.

This project aims to create a protocol for the Lumicyano one-step fluorescent cyanoacrylate fuming process for different types of evidence such as, plastic bags, cups, metal bowls, and glass cups, using Attestor's MEGAfume. Different parameters such as relative humidity, fuming time, and percent concentration will be tested to determine the best fit for each kind of evidence.

Methods

Evidence Preparation

The perspiration generated by the face was used to create fingerprints on various objects, these objects were used as "evidence."

Solution Preparation

The amount of Lumicyano powder for a given concentration (100 mg for 5% concentration, 120 mg for 6% concentration, 140 mg for 7% concentration, and 160 mg for 8% concentration) was weighed out in a foil dish and the scale was tared. 2.0 g of the Lumicyano solution was then added. The solution was mixed by swirling the foil dish.

Attestor MEGAfume

The settings on the MEGAfume were the parameters being tested. 70%, 75%, and 80% relative humidity were tested for each type of evidence. 20 minute, 25 minute, and 30 minute fume times were tested for each type of evidence. 5% concentration, 6% concentration, 7% concentration, and 8% concentration were tested for each type of evidence. The different settings were adjusted based on the results of the previous test. With each kind of evidence, the first test ran was with the factory settings on the MEGAfume and the settings were adjusted from there.



Figure 4. Attestor MEGAfume⁶.

Photographing Fingerprints

Each print was then photographed using the LABview BV900 with the LIGHTcube, set to a 505 nm wavelength. The pictures were then edited using Photoshop to invert and enhance the prints. The photographs were compared and the optimal settings for each kind of evidence were determined.

Results

For plastic evidence, the optimal criteria for developing latent fingerprints is 5% concentration (100 mg powder, 2.0 g solution), 75% relative humidity, 10 minute saturation time, 120°C, and 20 minute fume time.

For metal evidence, the optimal criteria for developing latent fingerprints is 6% concentration (120 mg powder, 2.0 g solution), 75% relative humidity, 10 minute saturation time, 120°C, and 20 minute fume time.

For glass evidence, the optimal criteria for developing latent fingerprints is 6% concentration (120 mg powder, 2.0 g solution), 75% relative humidity, 10 minute saturation time, 120°C, and 20 minute fume time.

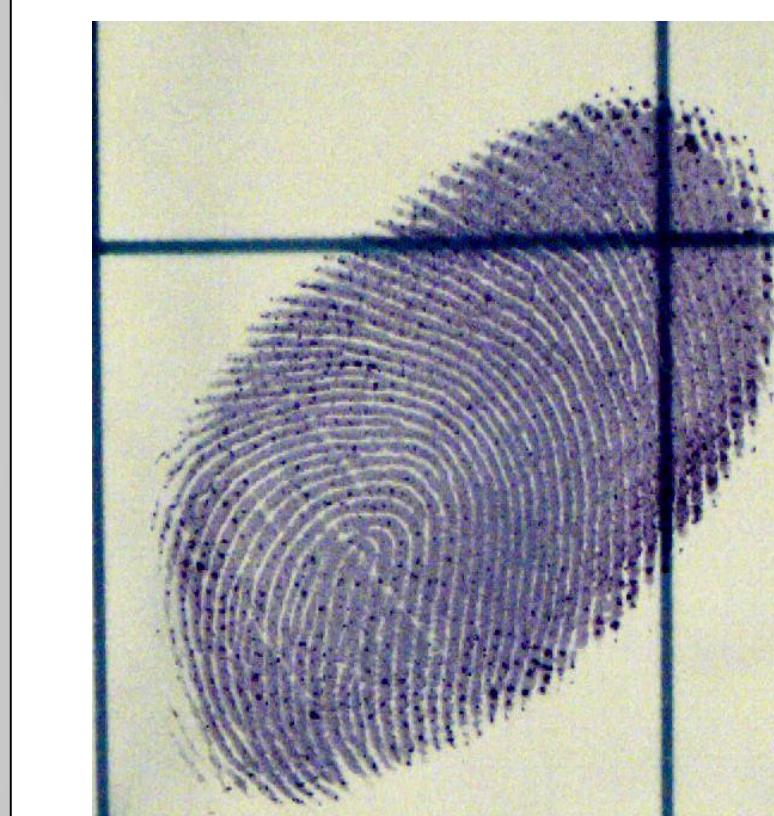


Figure 5. Plastic - 5% [], 75% rH, 20 minute fume



Figure 6. Metal - 6% [], 75% rH, 20 minute fume



Figure 7. Glass - 6% [], 75% rH, 20 minute fume

Future Directions

The results of this project, a developed protocol, will be sent out to different police stations across Pennsylvania to be utilized for fingerprint development.

Acknowledgments

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