A194 Evaluation of Nitrogen Spray Freezing Technique for Separating Duct Tape and Recovery of Latent Impressions

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The goals of this presentation are to: describe a nitrogen freezing technique using a cryogun for the separation of duct tape, describe the separation of duct tape by use of gradual force at ~22°C. (72°F), process latent impressions with a suspension powder, and enhance and evaluate latent images using computer software.

This presentation will impact the forensic community by discussing a technique involving the controlled release of liquid nitrogen using a cryogun to neutralize the adhesive on duct tape. This technique can be effectively used to separate tape for latent print processing.

Duct tape was introduced in the early 1940s and has been commercially available for use over sixty years. Duct tape has been used as a restraint in some crimes, as well as for sealing packages and containers collected into evidence. The tape may contain trace evidence as well as latent impressions. Both surfaces, adhesive and non-adhesive, may contain latent impressions. In this study, 200 donor impressions were placed on the surface of duct tape samples. One-hundred impressions were placed on the adhesive surface and 100 impressions were placed on the non-adhesive surface of the tape samples.

General purpose Scotch® 3M Duct Tape samples were prepared by cutting 100 pieces of cardboard into rectangular sections measuring ~88.9 x 215.9 mm (3½ x 8½ in). Pieces of duct tape ~50.8 mm (2 in) wide by 101.6 mm (4.0 in) long were cut and affixed to the approximate center of each piece of cardboard. A donor latent impression was placed on the non-adhesive side of the tape that was affixed to the cardboard. A second piece of duct tape ~50.8 mm (2 in) wide by 101.6 mm (4.0 in) long was cut and a donor latent impression was placed on the adhesive side of the second tape sample. The second duct tape sample was placed on top of the first piece of tape that was affixed to each piece of cardboard.

Two hundred duct tape samples with impressions were stored at ~22 C. (72 F) for 24 hours. One hundred of the samples, 50 impressions on the adhesive surface and 50 on the non-adhesive surface, were separated using gradual force and processed for latent impressions. One hundred impressions, 50 impressions on the adhesive surface and 50 on the non-adhesive surface, were separated by spraying the tape with liquid nitrogen using a Brymill CRY-AC® Cryogun. The liquid nitrogen exited the cryogun nozzle at approximately −196 C (−321°F) and within seconds neutralized the tape's adhesive. After separating the tape, 200 latent impressions were processed with WetWop™, a suspension powder, and enhanced with Jasc® computer software.

To determine the more superior method for separating duct tape when latent prints are present on the tape, latent impressions were developed on tape separated by gradual force and compared to impressions on tape separated with liquid nitrogen applied with a cryogun. Once the tape samples were separated, the suspension powder was brushed onto the tape surfaces with a camel hair brush. Following a period of 15 seconds, each sample was rinsed with distilled water to remove excess suspension powder. Next, the samples were photographed with a moticam digital camera on a stereoscopic microscope at 7 magnification. Each of the 640 x 480 pixel images were corrected with Jasc software. Then each image was sharpened, converted to a grey scale, and the contrast was enhanced prior to being evaluated. A rating of poor, medium, or excellent was assigned to each impression based on its quality. Poor quality impressions displayed no minutiae to limited ridge minutiae. Medium quality impressions had some minutia and pattern. Excellent quality impressions had numerous minutiae and a more complete pattern.

When gradual force at ~22 C. (72 F) was used to separate the duct tape, the non-adhesive surface produced 40 out of 50 impressions that were poor, 8 out of 50 impressions were medium and 2 out of 50 impressions were excellent. For the adhesive surfaces, there were 6 out of 50 impressions that were poor, 20 out of 50 were medium and 24 out of 50 were excellent. For the samples that were separated using liquid nitrogen, the non-adhesive surface had 43 out of 50 that were poor, 6 out of 50 that were medium, and 1 impression out of 50 that was excellent. The adhesive surfaces of the tape yielded 1 out of 50 that was poor, 7 out of 50 that were medium and 42 out of 50 that were excellent.

In this study, the tape separated with liquid nitrogen using a cryogun yielded more latent impressions on the adhesive surface that were rated excellent compared to latent impressions recovered at ~22 C. (72 F) using gradual force. Of the 200 impressions processed, 21% (42) of the impressions were rated as excellent when liquid nitrogen was used on the adhesive surface compared to 12% (24) of the impressions when gradual force was used. However, only 0.5% (2) of the impressions were rated as excellent compared to 1% (1) with liquid nitrogen for non-adhesive surfaces. Therefore, when collecting latents from multiple layers of duct tape, investigators should consider using liquid nitrogen applied with a cryogun to separate the tape.

Liquid Nitrogen, Latent Impressions, Duct Tape

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