

## Liquid Nitrogen For Separating Tapes From Surfaces

*Dear F.D.I.A.I. Friends*

*We recently received an international request for information regarding the use of Liquid Nitrogen for the purpose of separating tapes from surfaces and tape adhered to tape contact. To date we are not aware of any journal publications regarding the use of Liquid Nitrogen for this purpose. So in sharing the information with the requesting agency, I thought it might be of benefit to make this written response available to my fellow forensic members for practical application purposes. The response forwarded abroad is as follows:*

As an agency, we adapted the use of this chemical in the early 1980's when Mr. Tim Whitfield, our current Forensic Sciences Manager, was introduced to this procedure during a visit to the Orange County Sheriff's Office in Orlando, Florida. Mr. John Fischer, a forensic laboratory chemist formerly with the Orange County Sheriff's Office, appears to be the author of this technique and was the person who shared this information with Mr. Whitfield at that time. Mr. Fischer has since retired from his position in law enforcement, and did not author any articles during his career on this subject. Since that introduction, we have routinely used it to attempt the tape separation process, with surprisingly good results.

As an agency, we are supplied by a local chemical company with a 30 gallon cryogen approved storage canister. Physicians, such as plastic surgeons and dermatologists, also make use of Liquid Nitrogen and are also sometimes willing to assist by donating a limited supply if asked for crime fighting purposes. Because of its oxygen displacement behavior, it is important to perform this technique in a well ventilated area. The M.S.D.S. recommended safety equipment should be worn to include heavy non porous rubber gloves. The tape can be submersed into an insulated container partially filled with the chemical, or the Liquid Nitrogen can be poured over the tape. A small ice chest has served us well in this procedure. Immediately after contact with the chemical immersion the tape will harden in a heavily starched fashion.

At this time, very gentle but firm pressure in the direction necessary to complete separation should be applied. Broad tipped forceps without serrated gripping teeth can be used for this separation process, but I have personally resorted to using my gloved hands to carefully pull apart small areas of bound tape, especially when an area of the tape begins to split or tear apart along a tightly folded edge of the tape. As the tape is pulled from the surface it is adhered to, it is very important to monitor the thawing condition of the tape. As quickly as it is frozen by the Liquid Nitrogen process, it returns to its' room temperature original softened state nearly as fast. When you see the adhesive begin to stretch during the pulling procedure, it is time to stop and apply more Nitrogen.

This is sometimes a very lengthy process consisting of numerous "dips and pulls". I have worked with sections of bound tape for up to 2 hours and then secured the tape for processing at a later time due to a loss of patience and the temptation to expedite the process in a destructive frustrated manner. This process works best with heavier fabric woven duct tapes, but is not limited only to this type. I have successfully separated black electrical tapes and different types of packaging tapes, as well. Some clear plastic tapes can become very brittle if left in the vat of Liquid Nitrogen for too many seconds. It is best to locate the same brand of tape for testing by dipping the tape and quickly removing it to establish its tolerance for the procedure. Subject the tape to a brief dip, an in and out motion, and remove it to confirm its frozen state, and begin the separation process.

The best results to date have been achieved when separating tape from tape, when it overlaps itself, such as when a victim has been restrained with multiple layers of tape around the hands, arms, legs, or face. Good results can be achieved when tape is partially crumpled or folded back upon itself, but this requires extreme levels of patience and the results sometimes include rips and tears, especially with woven thread reinforced tapes. Obviously, another routine use of tape is the packaging of and attempted concealment of narcotics. This packaging procedure usually consists of a wrapped layering method. If cutting into the package is required to determine its' contents, it is best to avoid areas where the end of a section of tape is readily visible as this is where the greatest potential for ridge detail appears to be. This is apparent due to the usual hand holding method involved in tearing the tape from its' original roll.

It is a personal recommendation of mine to photograph the bound sections of tape prior to attempting the separation process, as many times you will be astonished at how well the procedure works and you are left with no record of how badly the tape was bundled prior to all of your hard work. Also prior to beginning the separation process, a Light Energy scan of the adhesive side and non-adhesive side of the tape should be completed in search of possible inherent luminescent ridge detail, hair, and fiber evidence. Photography documentation should be completed of any items recovered and collection of same at this time. Upon separation of the tape, a decision needs to be made as to which chemical development technique should be used. It is our agency's experience based opinion that the adhesive side of the tape holds the greatest potential for fingerprints. This is based on the theory that the adhesive on the tape creates the greatest medium for maintaining the deposited print residue and possible skin cell transfer.

Throughout the years we have used a number of chemical development techniques for the adhesive side of the tape to include Gentian Violet, Colloidal Gold, and Physical Developer. Currently our primary method of choice is the Sticky-Side Powder process. When processing dark colored tapes, I have successfully mixed very fine white powders with Sticky-Side powder resulting in better observable developed ridge detail. After a very delicate rinse process taking care to only expose the adhesive side of the tape to a flowing rinse source, such as a faucet sink arrangement, the next and final step of processing is Cyanoacrylate for the treatment of the non-adhesive side of the tape. Ideally the use of a vacuum system such as the CYVAC, will yield the most sensitive results on the sometimes slick surface of tape related evidence, but a traditional atmospheric system, such as an aquarium, will yield good results, also. Following this final procedure the tape should be processed with a fluorescent dye stain if a quality alternate light source is available.

If a light source equivalent in power to the Luma-Lite is not available, the use of magnetic powders and a strong oblique white light source can be used to locate ridge detail after application of the powder. While powders are usually moisture sensitive, it appears magnetic powder clings fairly well to the prickly fibrous texture of the Cyanoacrylate residue. The obvious advantage gained, if the powder clings to the ridge material, is the opportunity to lift the developed ridge detail. I would still strongly encourage you to photograph the ridge pattern prior to attempting the lift as it is possible that some of the pattern may not lift, leaving valuable ridge detail behind.

I certainly hope that this summary of our collective experience with the use of Liquid Nitrogen will assist you in the pursuit and apprehension of criminals. If we as an agency or myself personally can assist you further, please do not hesitate to contact us. Best wishes in your search for excellence!

*P.S. Our Forensic Sciences Section is available on the Internet E-Mail system. The address is:  
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