TECHNICAL NOTE

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A Modified Super Glue® Technique—The Use of Polycyanoacrylate for Fingerprint Development

REFERENCE: Almog, J. and Gabay, A., "**A Modified Super Glue® Technique—The Use of Polycyanoacrylate for Fingerprint Development,**" *Journal of Forensic Sciences*, JFSCA, Vol. 31, No. 1, Jan. 1986, pp. 250-253.

ABSTRACT: Latent fingerprints on various items were developed by exposing them to fumes obtained by heating the solid polymer, polycyanoacrylate. The results were comparable in quality to those obtained by the regular Super Glue® technique, based on the liquid cyanoacrylate monomer which is harder to handle. Without heating, the development process required much longer periods of time. Two simple devices have been constructed that use the new technique.

KEYWORDS: criminalistics, fingerprints, polycyanoacrylate

Cyanoacrylate esters, also known as Super Glue®, are used by many law enforcement agencies to develop latent fingerprints on various surfaces [*1,2*]. The technique is quite simple: the items to be developed are enclosed in a chamber into which commercial Super Glue is introduced. The liquid Super Glue forms a vapor of cyanoacrylate ester in the chamber that selectively polymerizes on fingerprint ridges, producing a hard, white-colored deposit of polymeric material.

The liquid monomers are not particularly easy to handle, and they adhere strongly if the liquid comes into contact with the skin or eyes. They also polymerize readily [*3,4*]. On several occasions, the entire contents of the tube or bottle containing cyanoacrylate esters of various brands polymerized spontaneously, forming one piece of hard white polymer which, according to the common procedure, was useless for fingerprint development. We found out, however, that this white polymer not only developed latent fingerprints (by producing fumes of monocyanoacrylate) but also had a few advantages over the liquid Super Glue.

Experimental Procedure

The first system in which an attempt was made to use the solid polymer as a source of cyanoacrylate fumes was a glass desiccator. The items to be developed were suspended inside by means of wire (Fig. 1). A small test tube containing some tiny beads (about 3 by 3 mm each) of the polymer from an old bottle of Super Glue was suspended inside as well, with its

Received for publication 27 Feb. 1985; accepted for publication 27 March 1985.
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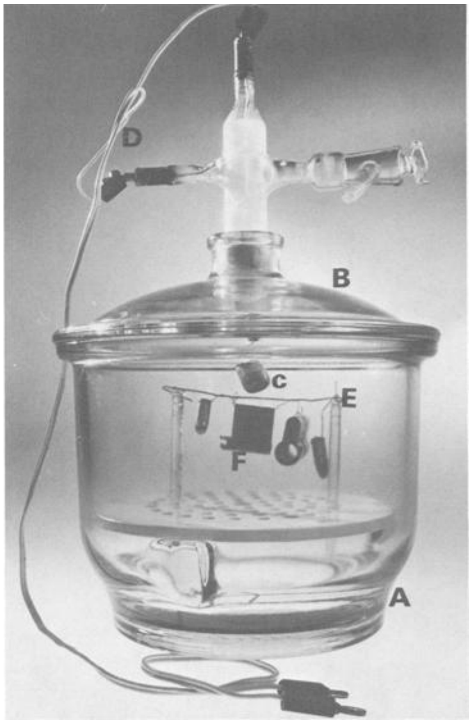


FIG. 1—*A fuming chamber where* A *is a glass desiccator,* B *is a glass lid,* C *is a glass test tube containing some polycyanoacrylate beads,* D *is an electric wire connected to a power source,* E *is a wire holder, and* F *is evidence.*

opening some 10 cm from the items. The test tube was surrounded by electric wire connected to a power supply (6 V, 10 W). Under such conditions the temperature inside the test tube reached about 200°C within a few minutes.

Another development chamber is even simpler. It was designed to suit the work conditions outside the police laboratory, especially those of our field technicians. The chamber consists of a polythene bag, an empty glass drying tube (such as those used in the chemistry laboratory), and a rubber blower (Fig. 2). The exhibits to be developed were placed inside the bag which was then attached by a tight rubber band to the drying tube containing a few beads of polycyanoacrylate. The beads were heated gently by a heat source such as a candle or a small alcohol burner. When white fumes filled the tube, they were swept to the bag by a stream of air produced by the blower. Latent prints on the items became visible after a few minutes. The system could then be disassembled.

Results and Discussion

In no case were the results obtained by the modified method inferior to those obtained on similar items by the common Super Glue method. The modified technique also had the following advantages over the common procedure:

(1) accelerated process without the use of corrosive chemicals,
(2) there is no inconvenience of sticking or gluing of items (or fingers),
(3) the solid beads are more convenient for handling and storage, and

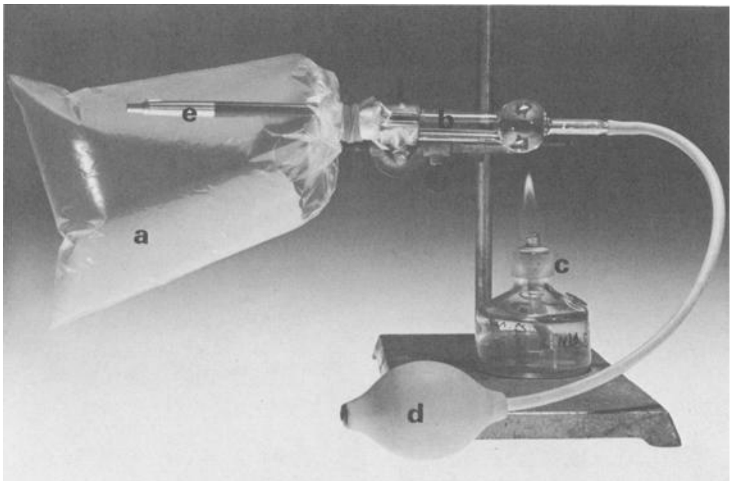
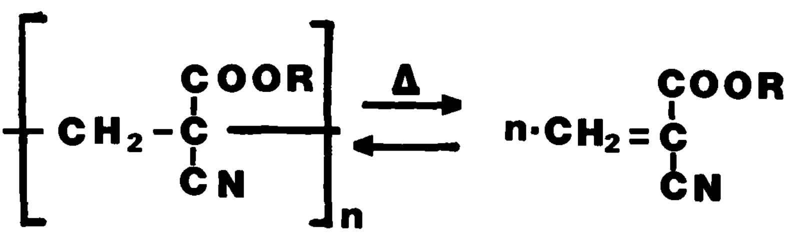


FIG. 2—*The field kit consists of* (a) *polythene bag,* (b) *drying tube containing polycyanoacrylate beads,* (c) *heat source,* (d) *rubber blower with rubber tubing, and* (e) *evidence.*



I — Polycyanoacrylate

II — cyanoacrylate monomer (the main ingredient of super Glue)

FIG. 3—*Formation of cyanoacrylate monomer by pyrolysis of polycyanoacrylate.*

(4) it utilizes as a reagent a material that so far was a mere waste and nuisance (the polymer).

Typically, cyanoacrylate monomers (II) are prepared by pyrolysis of polycyanoacrylates[3] (I) as shown in Fig. 3 [*3,4*].

The production of the liquid monomer is not easy. Repolymerization at high temperature tends to take place spontaneously, especially at the condensation point during distillation [*3,4*]; but the liquid monomer is essential for its main task—gluing. In fingerprint development, however, when the cyanoacrylate reacts in the vapor phase, there is apparently no need for the liquid monomer, and it can be derived in situ as a vapor from the solid polymer. Thus the layer of old glue, which is a nuisance as it acts as an insulator between the heat source and the new glue [*5*] in the heat-accelerated procedure, may become the sole source of cyanoacrylate fumes upon sufficient heating.

[3]Polycyanoacrylates are obtained by condensation of formaldehyde with cyanoacetates [*3,4*]. They are also formed commonly by polymerization of cyanoacrylate monomers.

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