

TECHNICAL NOTE

J. I. Thornton,¹ D. Crim.

Modification of Fingerprint Powder with Coumarin 6 Laser Dye

In previous articles in this journal, Menzel and co-workers [1,2] have described the use of the argon-ion laser for the visualization of latent fingerprints by inherent luminescence or by dusting with a dye which fluoresces when excited by the laser beam. These workers found that finely ground laser dye powders, while attractive from the standpoint of sensitivity and position of excitation and emission maxima, do not have the adhering properties desired of a fingerprint powder.

Coumarin 6 represents a very attractive laser dye, but even when finely powdered and used as a fingerprint dusting powder it does not record a latent fingerprint with the fidelity expected with conventional fingerprint powders. Since coumarin 6 is such an efficient dye when stimulated with the argon-gas laser, attempts were made in the author's laboratory to mix a small quantity of coumarin 6 with other materials which would possess superior qualities as a fingerprint dusting powder. Mixing the finely ground dye with kaolin, illite, and montmorillonite in various proportions did not prove satisfactory. However, dissolving the coumarin 6 in ethanol, mixing with the clays, and allowing the solution to evaporate did result in a fingerprint powder that had reasonable adhering properties and at the same time was homogeneous with respect to the laser dye. The best results, however, were obtained by mixing an ethanolic solution of coumarin 6 with conventional black fingerprint powder at a ratio of 1 part of dye to 100 parts of fingerprint powder and then allowing the ethanol to evaporate. Representative fingerprints developed with this mixture are shown in Figs. 1 and 2. The mixture has some distinct advantages. Many workers consider black fingerprint powder to be superior from the standpoint of adherence without smearing and use black fingerprint powder on all substrates, even black ones. Another attendant advantage is that the black lift, placed on a white background, may be compared with greater ease with inked fingerprints of a suspect. If the black fingerprint powder is tagged with the coumarin 6 dye, it may be used as a conventional powder if the latent is developed with sufficient clarity and detail to lift the developed print. In the case of a marginal print, the lifting process may be deferred until after the print is placed in the laser beam and recorded photographically. Since the laser beam will enable the visualization of picogram amounts of the coumarin 6 dye, only an exceedingly small amount of the powder is needed to adhere to the ridges of the latent fingerprint. In the author's laboratory this has been

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¹Associate professor of forensic science, Department of Biomedical and Environmental Health Science, School of Public Health, University of California, Berkeley, Calif. 94720.



FIG. 1—Fingerprint developed on Styrofoam® cup with black powder tagged with coumarin 6 laser dye. The laser configuration and operation are as described by Dalrymple et al [1].



FIG. 2—Fingerprint developed on an apple with black powder tagged with coumarin 6 laser dye.

demonstrated with considerable success with fingerprints on beverage bottles and cans that had been initially handled when cold, but with the fingerprints dusted the following day, after the condensation had evaporated. Attempts to lift developed prints with fingerprint tape and subsequently examine the lifts under the laser beam have not been successful because all of the fingerprint lifting tapes thus far examined have shown objectionably strong background fluorescence.

References

- [1] Dalrymple, B. E., Duff, J. M., and Menzel, E. R., "Inherent Fingerprint Luminescence—Detection by Laser," *Journal of Forensic Sciences*, Vol. 22, No. 1, Jan. 1977, pp. 106-115.

- [2] Duff, J. M. and Menzel, E. R., "Laser-Assisted Thin-Layer Chromatography and Luminescence of Fingerprints: An Approach to Fingerprint Age Determination," *Journal of Forensic Sciences*, Vol. 23, No. 1, Jan. 1978, pp. 129-134.

Address requests for reprints or additional information to
Dr. J. I. Thornton
Department of Biomedical and Environmental Health Science
School of Public Health
University of California
Berkeley, Calif. 94720