COMPARISON OF MASKING TAPES BY FLUORESCENCE SPECTROSCOPY

Robert D. Blackledge

USACIL-Europe
APO New York

Masking tapes as well as other tapes are frequently used in criminal activities. Such tapes may be used to bind and gag victims of kidnappings, robberies, homicides and sex crimes. In burglaries tapes may be used to prevent doors from latching, or they may be used to prevent noise from falling glass. Tapes are also frequently used in assembling explosive devices.

Ideally, latent or visible prints are found and they identify the suspect, or one end of the tape forms a physical match with the end of a roll of tape found in the possession of the suspect. But failing these possibilities, it is still worthwhile to compare the tape with any tapes that may be found in the possession of the suspect(s), or found at similar crime scenes.

Recently, the author was asked to compare small bottles containing hashish oil that had been obtained in three separate investigations. The bottles were all of the same brand and size, and all had pieces of masking tape on the outside and a price written thereon in blue ink. Comparison of the tapes, as well as the inks, indicated that all of the bottles could have originated from the same source.

Experimental results indicated that different brands of masking tapes could be distinguished by a combination of examinations including visual, infrared (IR) spectroscopy and pyrolysis gas chromatography (Py-GC). More interestingly, there were indications that fluorescence spectroscopy might be capable of distinguishing between different production runs of the same brand. The probability that two tapes might have originated from the same source would be much greater if not only different brands but also different production runs within a brand could be distinguished.

In fluorescence spectroscopy by traditional methods two spectra are produced, an emission spectrum and an excitation spectrum. Although this works well for many samples, with complex mixtures containing several fluorescent components the overlapping of the various spectra may result in a relatively featureless curve. In the examination of complex mixtures, better resolved spectra are frequently obtained by synchronously varying both the excitation and emission wavelengths. The synchronous technique (Lloyd 1971) was used exclusively in the present study, with most spectra being obtained with a fixed wavelength difference of 20 nm.

Three different brands of beige colored masking tape were examined using a Perkin-Elmer MPF-3 fluorescence spectrometer (Norwalk, CT). Instrument conditions were excitation and emission slits both set at 4 nm, sample sensitivity at 10, scan speed at 4, and chart speed at low.

First, the exterior surface of the tapes were examined using the front surface accessory. The different brands produced different spectral patterns. Although varying in fluorescence intensity, the different brands produced consistent patterns both within a tape roll and also between tape rolls from the same sample lot. Two samples that were from the same brand but different lots gave different patterns. One sample was examined both before and after dusting for prints using a Magna brush and a mixture of black powder and iron filings. After wiping the exterior surface with a laboratory tissue, the fluorescent pattern showed little change except for a reduction in fluorescence intensity.

After examining the exterior surface, small pieces of tape were soaked in dichloromethane. The solution was filtered through glass wool and then two drops were placed in a cuvette and diluted with more dichloromethane. These solutions were examined using the same instrument conditions. Again, different brands gave different fluorescence patterns, as did different lots of the same brand.

After the examination by fluorescence spectroscopy, IR spectroscopy (Noble *et al.* 1974; Pattacini 1974) and/or Py-GC (Noble *et al.* 1974) examinations may be carried out by evaporating the same solutions onto KBr disks for IR spectroscopy or onto ribbon probes for pyrolysis.

REFERENCES

Lloyd, J. B. F. (1971). Synchronized excitation of fluorescence emission spectra, Nature Physical Science 231:64-65.

Noble, W., Wheals, B. B. and Whitehouse, M. J. (1974). The characterization of adhesives by pyrolysis gas chromatography and infrared spectroscopy, Forensic Science 3:163-174.

Pattacini, S. C. (1974). Infrared identification of adhesive formulations, Perkin-Elmer Infrared Bulletin 43:1-11.

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