



B105 Comparison of Lipstick Smears Using Attenuated Total Reflectance FTIR Microspectrophotometry

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The goal of this presentation is to evaluate ATR/FTIR as a technique for differentiating lipstick smears.

Lipstick smears are sometimes found at crime scenes in the form of imprints on drinking glasses or as blots on various types of paper. Lipsticks consist of organic dyes that are suspended in an oily or waxy matrix. There are other additives also added for gloss, brightening, etc. Some forensic methods of analysis involve extraction of the dyes and analysis to determine the color components. Infrared spectrophotometry provides a method for characterizing not only the dyes but also all of the major organic components. This has the potential of better differentiating among lipsticks that may have the same dyes but different matrices.

Lipstick blots may be especially difficult to handle, as they may be difficult to remove from the paper. Unless the smear is dry, it may be difficult to prepare for FTIR analysis. Attenuated total reflectance FTIR was evaluated to determine if it could be a useful technique in differentiating among lipsticks on paper because this method does not involve removing the lipstick from the surface upon which it was deposited.

Attenuated total reflectance (ATR) employs a crystal (zinc selenide) that is in contact with the lipstick. The IR radiation is reflected through the crystal many times, and each time some light is absorbed by the sample. This multipass reflection permits high sensitivity. The paper itself is used as a background that is subtracted from the IR spectrum.

Thirty-seven lipsticks were used. Standard bond paper was the substrate. Smears of each lipstick were made on the paper and then 3-8 spectra were taken of each smear as a check on uniformity. After each spectrum, the crystal was gently wiped with methanol. One hundred scans were obtained for each spectrum. The spectra were baseline corrected using the algorithm resident in the software.

After all spectra were obtained, representatives of each lipstick were converted into a spectral library. The library was then tested for internal consistency by running samples of members of the library. The exact match was obtained in one-third of the cases and the rest, with a couple of notable exceptions, were in the top 5 of the results.

The results indicated that ATR/FTIR may be used as a method for determining if two samples of lipstick could have a common source without having to remove the smear from its substrate.

Cosmetics, FTIR, Reflectance