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Trace Drug Detection in Latent Fingerprints Using Attenuated Total Reflectance-Infrared Spectroscopy

Abstract

Latent fingerprints can provide evidentiary information, beyond only the fingerprint pattern, through analysis of a lifted print and the exogenous compounds the finger may have come into contact with. Attenuated Total Reflectance Infrared Spectroscopy, a method known to be non-destructive, with reduced analysis time and limited sample preparation, is now applied toward the analysis of latent fingerprints for trace drug contaminants. Pure standards of Ibuprofen and Aspirin were analyzed individually using the ATR-IR to create a library of reference spectra. Fingerprints contaminated with trace amounts of each drug were deposited onto tape. Spectra resulting from tape lifts of blank fingerprints illustrated that the fingerprint peaks were negligible, and would not impact identification of the drugs. Blank tape spectra were subtracted from the spectra of drug contaminated tape lifts in order to isolate the drug and identify it. The procedure was repeated to analyze a latent fingerprint containing a mixture of Aspirin and Ibuprofen. The spectra of the mixture following the tape subtraction showed high matches to both the Ibuprofen and Aspirin reference spectra, indicating that both drugs can be simultaneously observed and recognized. Stereomicroscopes were utilized to determine that ATR-IR analysis does not interfere with the lifted fingerprint pattern, or the ability to identify minutiae. The drugs can be further isolated and confirmed by taking advantage of their optical properties through the use of Polarized Light Microscopy. Detection of trace drug and drug mixtures from latent fingerprints can be achieved through ATR-IR analysis while preserving the integrity and value of the fingerprint.