

Using synchrotron radiation to identify and characterize human chemical latent fingerprints – a novel forensic approach.

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Synchrotron radiation x-ray fluorescence microprobe and infrared spectromicroscopy have been used to generate fundamental data and to analyze and visualize latent human fingerprints with the goal of developing an advanced forensic technique to identify complicated partial latent prints. The chemical composition of fingerprints (sweat) is well documented in medical literature, and techniques abound to identify and develop latent prints. However, no useable technique currently exists to produce a forensic analysis of the fingerprint chemistry, or to identify the latent prints of pre-pubescent children. Fingerprints are essentially a mixture of sweat-based electrolytes, oils, fatty acids, steroid precursors, wax esters and water. In the case of young and pre-pubescent children, only aqueous electrolytes are present. Mapping of these electrolytes by means of x-ray fluorescence microprobe is discussed and detailed. IR band intensities and band intensity ratios for functional groups of chemical molecules that are inherent to the fingerprint system are discussed in the context of molecular species that can be identified by comparison to infrared spectra that have been reported previously in the literature for identified components.

This work was supported by the Director, Office of Science, Office of Basic Energy Sciences, Materials Science Division, the Office of Science Education of the U. S. Department of Energy under Contract Number DE-AC03-76SF00098.