



Faculty Capabilities and Interests

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Discipline: Forensic Science

Sub discipline(s): Forensic Chemistry, Forensic Microscopy

Areas of Research Interests:

Research interest: Trace Evidence Analysis, Gunshot Residue Analysis, Automobile Paint Chip Characterization Polymer blends, mainly morphological characterization using Scanning Electron Microscope, and Spectroscopic characterization IR.

Present research: Currently focused on surface chemistry and compositional change of the GSR particles and paint chips with X-ray Photoelectron Spectroscopy (XPS) and Time of Flight Secondary ion Mass spectroscopy (ToF-SIMS)

Skills:

- Surface Chemistry of Gunshot Residue (GSR) Particles by Time of Flight Secondary Ion Mass Spectrometry
- Trace evidence Characterization SEM/EDX, drugs using GC/MS,
- Characterization of Cocaine and Heroin by optical microscopy and infrared spectroscopy

Research Summary (*current, performed in the past 5 year; 300 words or less*)

Surface Chemistry of Gunshot Residue (GSR) Particles by Time of Flight Secondary Ion Mass Spectrometry (ToF SIMS) - Complement to Electron Microscopy (SEM/EDX)

The research is a study of gunshot residue (GSR) discharged by 0.22 Remington Gold ammunition. SEM-EDX is used to detect the morphology and chemical composition of the discharged particles. Spherical and non-spherical particles in the size range of 3-50 μm are observed and their compositions are examined using EDX. Composition varies with the size and shape of the particles. Combination of Lead (Pb), Barium (Ba) Antimony (Sb) or Pb, and Ba are found and characterized as GSR particles. The same specimens are further subjected ToF SIMS analysis with a view to identify the respective surface chemistry, molecular nature and molecular mass of the GSR particles. Secondary ion mass spectrum and the image analysis are carried out for selected particles. The mass peaks of oxides of lead, barium and antimony apart from the elemental masses are found. The combination of Pb/Ba/Sb and their oxides in a particular particle specifically establish the characteristics of a typical GSR particle.

Keywords (*5 maximum*) Gunshot residue, Paint chip, XPS, ToF-SIMS