B39 Forensic Elemental Analysis of Glass by Laser Induced Breakdown Spectroscopy (LIBS), Laser Ablation ICPMS, and X-Ray Fluorescence

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After attending this presentation, attendees will learn about different solid sampling techniques for elemental analysis: laser induced breakdown spectroscopy (LIBS), laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), scanning electron microscopy with an energy dispersive spectrometer (SEM EDX) and x-ray fluorescence (XRF). The advantages, disadvantages, and application of these techniques to forensic casework will be discussed.

This presentation will impact the forensic community and/or humanity by demonstrating the different solid sampling techniques for elemental analysis: laser induced breakdown spectroscopy (LIBS), laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), scanning electron microscopy with an energy dispersive spectrometer (SEM EDX) and x-ray fluorescence (XRF).

Materials analysis and characterization can provide important information as evidence in legal proceedings. Although the utility of trace elemental analyses for comparisons of glass, paint fragments, bullet lead and metal fragments has been shown to offer a high degree of discrimination between different sources of these materials, the instrumentation required for the generation of good analytical data in forensic comparisons can be costly and require a high degree of analytical sophistication. Refractive Index (RI) has been used for glass comparisons in combination with elemental analysis using a variety of methods of solid sampling, including; Scanning Electron Microscopy with an Energy Dispersive Spectrometer (SEM-EDX), x-Ray Fluorescence (XRF), Laser Ablation Inductively Coupled Plasma Atomic Emission Spectroscopy (LA-ICP-AES) and, more recently, LA-Inductively Coupled Plasma Mass Spectrometry (LA-ICPMS). A newly developed Laser Induced Breakdown Spectroscopy (LIBS) instrument (Foster and Freeman Ltd., Evesham, U.K.) has been evaluated as a tool for the forensic elemental analysis of glass and compared in performance to other elemental methods in order to determine the utility of comparing casework sized glass samples. Developments in instrumental design of the LIBS system are presented. The discrimination power afforded by the elemental analysis of a sample set having similar refractive indices measured by the LIBS system is reported in contrast to that provided by micro-XRF and LA-ICPMS. The advantages and disadvantages of using these solid sampling elemental analysis techniques will also be presented.

Solid Sampling Elemental Analysis, Glass, LIBS

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