B118 Evaluation of Laser-Induced Breakdown Spectroscopy as a Contributing Technique in the Analysis of Automobile Paint Samples

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The goal of this presentation is to familiarize the audience with new technologies potentially useful in the analysis of paint.

This presentation will impact the forensic community by demonstrating how LIBS is a high information content and inexpensive technology the may assist in many areas of forensic analysis.

Laser-induced breakdown spectroscopy (LIBS) provides an inexpensive and efficient method for obtaining information on the elemental composition of a sample. The method holds potential as an analytical tool to aid in the analysis of paint samples. This presentation reports on the use of LIBS in combination with other analytical techniques, FTIR(ATR) and SEM/EDS for the analysis of automobile paints. The report focuses on the development of sampling and data comparison methodologies.

The analytical methodology was developed and tested on a set of 51 automobile paint samples. The sample set was taken from range of automobile makes and models ranging in manufacture year from 1987 – 2006 and is comprised of a range of colors and modifiers supported on metal and plastic substrates. LIBS analytical methods involved a drilldown approach in which a series of successive spectra were collected from subsequent laser ablation events, and an approach wherein a paint chip was interrogated from the edge so that all paint layers were sampled in a single laser ablation event. FTIR spectra were collected for the exterior paint layer only using an FTIR-microscope with an attenuated total reflectance (ATR) attachment. Quantitative analysis was performed on samples using SEM-EDS. Samples were carbon coated for analysis and carbon and oxygen were excluded from quantitative analysis based on copper and/or cobalt standards.

LIBS spectra for the different paint samples were compared by calculation of a Euclidean distance and a Sorenson index to determine similarity. The Euclidean distance method was used to compare the FTIR spectra for each sample. Relative integrated elemental concentrations from EDS were compared between samples. The utility of FTIR and LIBS spectra for the identification of paint samples in a library/database search was evaluated through receiver operator characteristic (ROC) analysis. Results from the comparisons will be discussed and the potential development of a multi-instrument database for automobile paint identification will be presented.

This research was supported by the National Institute of Justice, Office of Justice Programs under award 2006-DN-BX-K251. The research was undertaken in collaboration with the South Carolina Law Enforcement Department and conducted at the National Center for Forensic Science, a member of the Forensic Resource Network. Views presented do not reflect the position of the government or infer endorsement.

Laser-Induced Breakdown Spectroscopy, Paint Analysis, Database

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