A75 Analysis of Automotive Paint Clear Coats by UV-Visible Microspectrophotometry, Raman Spectroscopy, and Fourier Transform Infrared Microspectrophotometry

Jay A. Siegel, PhD, John V. Goodpaster, PhD, and Emily Duckworth, BS, Indiana University Purdue University Indianapolis, School of Science, LD 326, 402 North Blackford Street, Indianapolis, IN 46202; Brandy Cline, BS, 175 South German Church Road, Indianapolis, IN 46229; Ashley Trantham, BS, Indiana University Purdue University Indianapolis, School of Science, LD 326, 402 North Blackford Street, Indianapolis, IN 46202; and Elisa Liszewski, BS, 3950 Gable Lane Circle, Apartment #328, Indianapolis, IN 46228*

After attending this presentation, attendees will understand how automotive clear coats are analyzed for forensic purposes and the ability

of UV microspectrophotometry, laser raman spectroscopy, and infrared microspectrophotometry to discriminate among clear coats.

This presentation will impact the forensic community by providing a new analytical tool in the characterization of automotive clear coats.

The purpose of this research project is to evaluate several analytical techniques for their ability to discriminate among automotive clear coat finishes. Automotive paints have been important examples of trace evidence in crime laboratories for many years. Paint chips and/or smears are found at many automobile crash scenes including those involving multiple automobiles or a vehicle and a pedestrian. Paint evidence may be transferred from one car to another or to clothing or the body of a pedestrian. Automobile paint consists of several layers. These include one or more primer layers which serve to provide a good adhering surface for subsequent layers and often to provide rust protection. Over top of primers are topcoats (color coats) which give the finish its color and help protect the body of the car. Since the early 1990s, car manufacturers have been adding clear coats to their paint finishes. The clear coats consist of a film former and one or more light scavengers. The clear coat protects the topcoats from scratches, dents, breaks and the ravages of ultraviolet light. Forensic analysis of automotive paints involves a series of visual and analytical tests that may be done on the paint as a whole, with all of the layers intact or on individual layers. Such tests include analysis of the layer structure including thicknesses and color of each layer. Other tests are used to determine the chemical structure of the binders and pigments present in individual layers of the paint. Tests include pyrolysis-gas chromatography, infrared spectrophotometry, visible spectrophotometry and, more recently, raman spectroscopy. Most of the analysis of paints focuses on the topcoats and on the primers. Until recently, very little work has been done on clearcoats. In this project, a number of analytical techniques were evaluated for their ability to discriminate among clear coats. More than 200 samples of automotive finishes were obtained with make, model and year data, from paint and body shops and junkyards. These were sectioned and the clear coats isolated. They were subjected to UV microspectrophotometry, laser Raman Spectroscopy and infrared microspectrophotometry. The data collected was analyzed using statistical techniques including clustering, principle component and discriminate analysis. This paper reports mainly on the results obtained with UV microspectrophotometry. Results show that this technique is useful in discriminating clear coats.

Automobile Paint, Clear Coat, UV Microspectrophotometry

 ** Presenting Author*