A179 Improved Methods for the Discrimination of Automotive Paint Clear Coats Using Microspectrophotometry and Chemometrics

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After attending this presentation, attendees will have a better understanding of how automotive clear coats are analyzed for forensic purposes, how proper sample preparation and UV microspectrophotometry can discriminate among clear coats, and how chemometrics can provide further distinction among visually similar clear coats.

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

The purpose of this research is to revaluate this analytical technique for its ability to discriminate among automotive clear coat finishes by applying a different sample preparation technique. Automotive paints have been important examples of trace evidence in crime laboratories for many years. Paint evidence is often found at the scenes of automobiles crashes and can be transferred between cars or from a car onto a person. Automobile paint consists of several layers. These include one or more primer layers which serve to provide a good adhering surface for subsequent layers. Over the 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 coat protects the topcoats from scratches, dents, breaks, and damage caused by ultraviolet light. In most situations, paint cannot be attributed back to a specific source so testing focuses on generating as much physical and chemical data on the paint in question and a known sample of paint from the automobile. Frequently this analysis focuses on the colored paint including the number and sequence of the layers. Automotive clear coats have not been studied extensively because they have no color and have only become a staple on automobiles within the last twenty years. By studying clear coats, more data can be generated about paint evidence and thus a better association can be drawn between the transferred and native paints.

Samples of automotive finishes were obtained with the make, model, and year data, from paint and body shops and junkyards, resulting in 360 spectra. This database is larger in size and more diverse than before, now including a few foreign exemplars. Initial sample preparation included the use of a microtome with an association binding medium (Lensbond). The chemometric data resulted in three main classes of clear coats; however, these results were skewed due to this mounting medium

absorbing in the UV range. The current research involved a different sampling technique that involved shaving off the clear coat and using these paint peels and thus avoiding a mounting medium issue. Statistical techniques including clustering, principal component analysis, and discriminant analysis were applied to the spectra. Based upon cluster analysis, four main classes of clear coats were present among the data set. Overall, the results show that this technique is more useful in discriminating clear coats. This improved method resulted in more defined spectra, and overall the database improved in size and diversity. The chemometric analysis resulted in more discrimination and reliable classes.

Clear Coat, UV Microspectrophotometry, Chemometrics

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