B72 Identification of Organic Pigments in Automotive Coatings Using Laser Desorption-Mass Spectrometry (LD-MS)

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After attending this presentation, attendees will be aware of an alternate instrumental technique (LD-MS) for the analysis of automotive coatings for the presence of organic pigments.

This presentation will impact the forensic community and/or humanity by providing the possibility of using laser desorption-mass spec- trometry (LD-MS) as a complimentary technique for the identification of benzimidazolone, quinacridone, and phthalocyanine class organic pig- ments in automotive coatings. LD-MS can provide lower detection limits and molecular weight data so that certain pigments may be conclusively identified. This technique will also provide for the separation of the organic components from the inorganic components thereby eliminating the spectral overlap issues that occur when using FTIR.

The goal of this presentation is to offer the forensic community an alternate way to analyze automotive coatings for the presence of organic pigments and presents the possibility for an alternate means to identify organic pigments in automotive coatings.

Automotive coatings frequently play an important role in investiga- tions of vehicular hit and run incidents. Be it a vehicle hitting an individual, another vehicle or an inanimate object, some portion of the suspect vehicle's paint is often left behind. This evidence can serve two purposes:
1) If a suspect vehicle is located, a comparison of any questioned paint from the scene or victim to the known paint from the vehicle can be performed; and 2) If a suspect vehicle is not available, any paint left at the scene or on the victim may be useful for developing investigative leads. Of the two possibilities listed above, this paper is primarily concerned with the latter.

In order to provide investigative leads, the questioned paint must be chemically analyzed in such a way so that as many of its individual com- ponents as possible can be identified. The results would then be compared to a comprehensive database so that ideally, a possible make, model and year of suspect vehicle may be obtained. The collaborative efforts of the Royal Canadian Mounted Police (RCMP) and Federal Bureau of Investigations (FBI) have provided the forensic community with such a database in the form of the Paint Data Query (PDQ).

The PDQ is based on the input of data obtained from visual, elemental and spectroscopic analysis of questioned samples. Generally, as more com- ponents of questioned paints are identified, the discrimination potential of such evidence increases. With recent shifts away from inorganic pigments which often contain heavy metals such as Pb and Cd, organic pigments have become more prevalent in automotive coatings. Therefore the identi- fication of organic pigments would be advantageous in generating a shorter list of possible suspect vehicles.

In its current state, the PDQ does not include organic pigments in its identification scheme. This absence may be due in part to a lack of research in this area. It has recently been shown that organic pigments can be iden- tified in automotive paints using Fourier Transform Infrared Spectroscopy (FTIR). However, in certain instances the relatively low concentrations of organic pigments typically found in automotive coatings may make it dif- ficult to make an identification using FTIR alone. In addition to the low concentrations of organic pigments, automotive coatings frequently contain inorganic pigments, flakes and fillers that tend to overlap with the charac- teristic spectral features of organic pigments when using FTIR.

The purpose of this research is to explore the possibility of using laser desorption-mass spectrometry (LD-MS) as a complimentary technique for the identification of benzimidazolone, quinacridone, and phthalocyanine class organic pigments in automotive coatings. LD-MS can provide lower detection limits and molecular weight data so that certain pigments may be conclusively identified. This technique will also provide for the separation of the organic components from the inorganic components thereby elimi- nating the spectral overlap issues that occur when using FTIR.

Organic Pigments, Automotive Coatings, Laser Desorption-Mass Spectrometry

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