B132 Use of a Database of Elemental and Refractive Index Values From Glass Samples to Determine the Significance of "Matching" Profiles in a Comparison Between Glasses

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The goal of this presentation is to present the evaluation of elemental and refractive index data from the analysis of ~700 different glass samples with the aim of aiding trace examiners in the interpretation of glass comparison data.

Elemental analysis of glass fragments by Inductively Couple Plasma Mass Spectrometry (ICP-MS) has been shown to provide an excellent means for distinguishing between different glass samples. ICP-MS provides quantitative data for the determination of metals that are present in trace level concentrations in the glass matrix. These measurements can be used to differentiate between very similar glass samples, resulting in a powerful test for distinguishing between glass fragments in a comparison.

The purpose of this presentation is to describe a number of different datasets resulting from the analysis of glass populations in order to determine the utility of the ICP-MS technique as a method for distinguishing between glass fragments. A statistical test to conduct and facilitate the pair-wise comparisons on the multivariate data is also presented. The interpretation of the results from this analysis leads to the conclusion that it would be an extremely rare occurrence for two glass fragments to contain indistinguishable elemental profiles if they did not originate from the same source of glass.

Data from 161 containers, 45 headlamps, and 458 float glasses (among them at least 143 vehicle windows) are presented and summarized. Data from the analysis of ~190 glass samples collected from a single glass manufacturing facility over a period of 4 years at different intervals, including ~100 samples collected in a 24-hour period are presented and data from the analysis of 125 glass samples representing several manufacturing plants in the U.S. are also presented.

A standardized method for the elemental analysis of glass by digestion and solution analysis has been subjected to a round-robin test by four different laboratories and the results of this round-robin are also presented. The precision and bias of the method are reported.

ICP-MS is shown to be an excellent method for distinguishing between different glass samples. Using the proposed method, the database supports the hypothesis that it is expected that different glass samples result in different elemental profiles and a comparison between fragments from the same source results in indistinguishable profiles.

One major disadvantage to the ICP-MS method is that the sample preparation step is time consuming and laborious. Laser ablation is an alternative sample introduction method that can address this disadvantage effectively.

Glass Analysis, ICP-MS, Data Interpretation

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