Analysis of pre and post Petroleum Combustion Components by DSA(Direct Sample Analysis): A New Ambient Ionization Source.

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1 Introduction

An important aspect of any forensic fire investigation is identification of any accelerants and the source of ignition. Direct Sample Analysis (DSA) Mass Spectrometry has the potential to provide rapid screening of samples taken directly from a fire with little to no sample preparation. The following poster presents the analysis of a variety of petroleum distillate products by DSA. Also included is the analysis of several samples of common household items that have been burned with gasoline and lighter fluid.

2 Instrument Parameters

The DSA ion source was attached to a PerkinElmer AxION TOF mass spectrometer. Sample position was adjustable via an XY stage. Software controls allowed adjustment of parameters including reagent gas composition, temperature, flow rate and instrument voltages. Source as well as sample position were adjusted to achieve maximum signal.

3 Instrumentation Setup

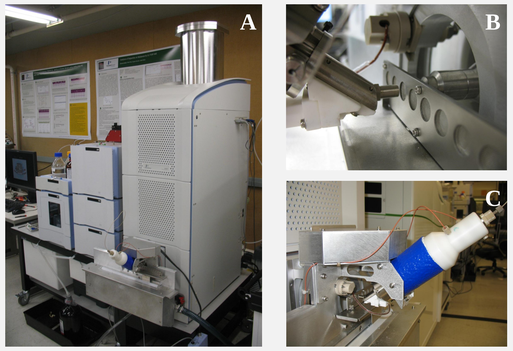
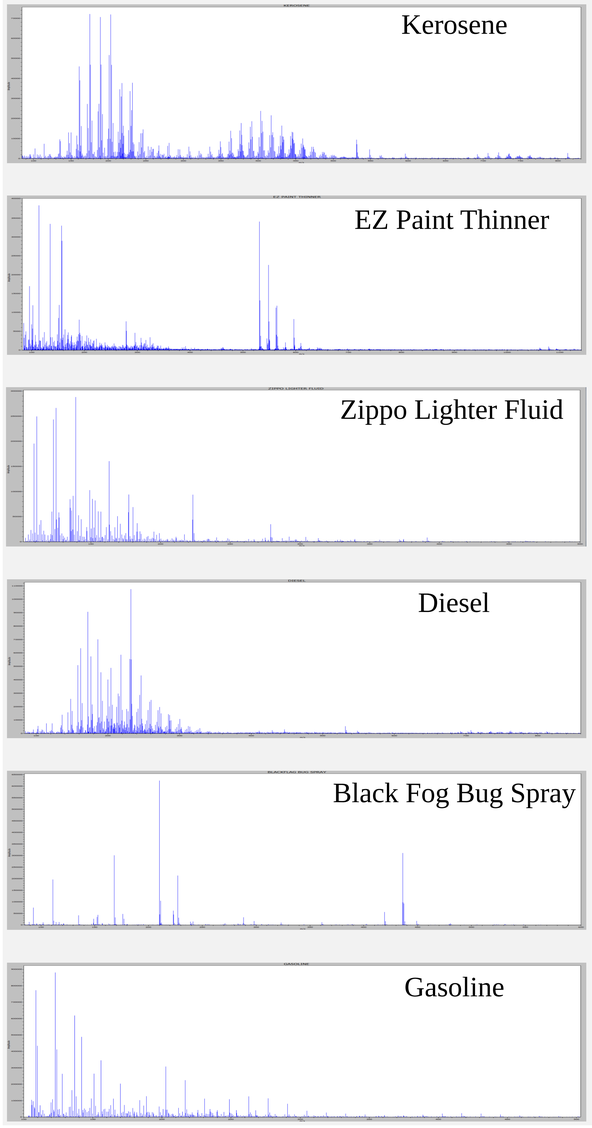


Figure 1. A) Overall view of the DSA attached to the AxION TOF. **B)** Close up view of the DSA sample tray inlet to the AxION TOF. **C)** Close up view of the DSA. **D)** Schematic of the DSA ionization source.

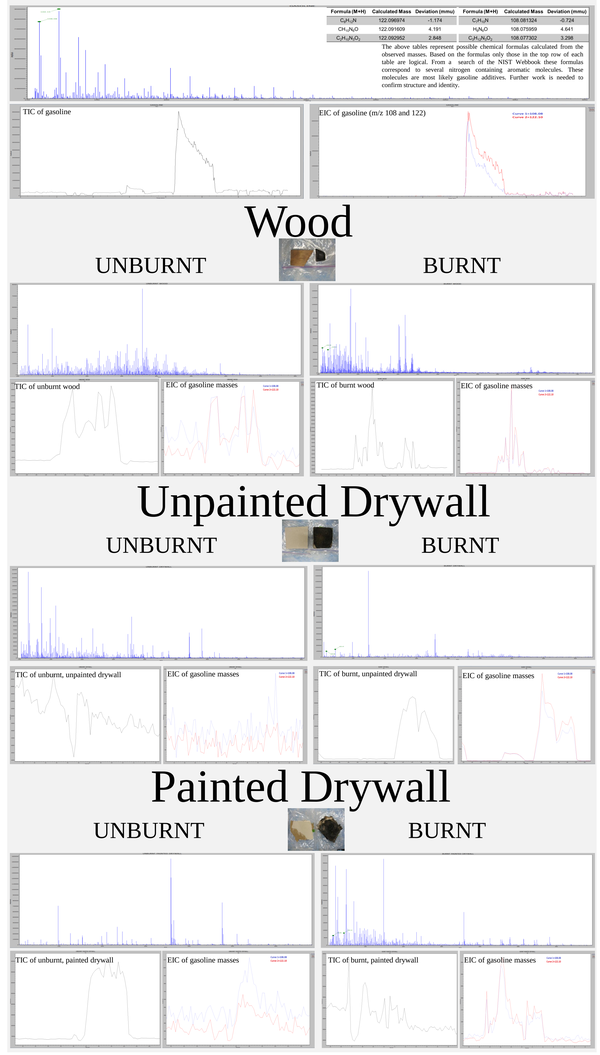
4 Petroleum Products

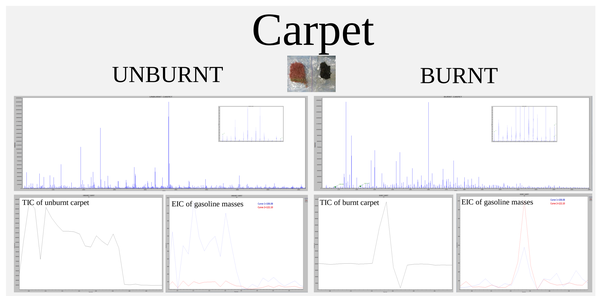
Each sample was applied neat, directly to the sample mesh of the DSA. Each sample was then exposed to the ionization source. A mass spectrum for each sample, shown below, was obtained from an average of the total ion chromatogram (TIC). Each spectrum took less than 3 minutes to obtain.



5 Control/Burnt Samples

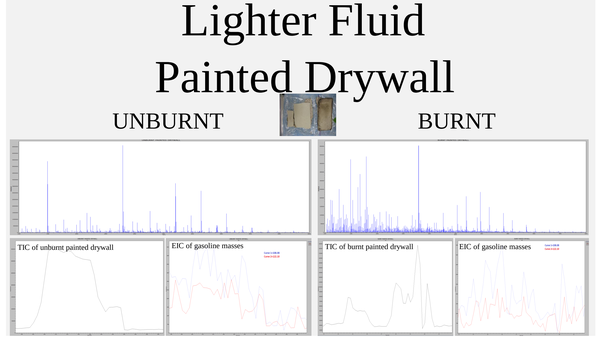
Gasoline was chosen for further testing on common building materials. Each burnt sample was doused with gasoline and allowed to burn until the sample was self extinguished. Each spectrum was obtained by holding the material directly in front of the DSA ion source with no sample pretreatment. A TIC is shown below and to the left of each spectrum. An extracted ion chromatogram (EIC) is shown below and to the right of each spectrum.





6 Negative Control

As a negative control, painted drywall was burned using lighter fluid. An EIC of the masses from gasoline is shown for the burnt sample. No masses found in gasoline were detected showing that those masses were indeed from gasoline and not the general combustion process.



7 Conclusion

The DSA ionization source has been shown to provide rapid analysis of samples directly with no pretreatment. Gasoline was successfully identified on each sample that had been burnt to completion with accelerant. Masses identified in the burnt sample were shown to be from gasoline and not the combustion process.

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