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Physical Sciences Category

Phys Sci Poster 15:

LC-MS methods development for metabolomics analysis by VSSI-MS

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Liquid chromatography mass spectroscopy (LC-MS) is widely used for metabolomic studies. Electrospray Ionization (ESI) is the standard ionization method in LC-MS due to its compatibility with the continuous flow of LC. However, ESI methods require external high voltage supplies, which are not suitable for chemicals sensitive to high voltage. To resolve these issues the Li group of West Virginia University has developed a new ionization technique called Vibrating Sharp-Edge Spray Ionization (VSSI). Since VSSI has been newly developed, this research project focuses on the development of methodology for the LC-MS system that will accommodate VSSI. The project involves optimizing the mobile phase, gradient, and flow rate for LC separation using a reverse phase (RP) C18 column. It was hypothesized that the addition of formic acid (FA) to the mobile phase would optimize the RPLC-VSSI-MS technique based on published research. The resulting data indicated that the FA additive was effective at optimizing the RPLC separation for the metabolites used to test the system. The preliminary RPLC-VSSI-MS data indicated an optimal effect resulting from the FA additive.

Phys Sci Poster 16:

Distance determination of firearm discharge: challenges of color tests and benefits of laser induced breakdown spectroscopy

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Crimes involving guns often include robbery, homicide, suicides and assaults. In firearm related investigations, the estimation of the firing distance assists with the reconstruction of the events. Current methods for distance determination include the Griess color test that turns orange in the presence of nitrites, and the sodium rhodizonate test that turns blue-violet in the presence of lead. Although these tests are practical, they lack selectivity and are highly subjective. Laser-Induced Breakdown Spectroscopy (LIBS) provides superior selectivity and sensitivity than color tests, enhancing the reliability of shooting distance analysis. In this study, a Springfield handgun with Remington primer was fired onto colored, and patterned fabrics at known distances (contact, 6 inches, 12 inches, 24 inches, and 36 inches), and distances that were unknown to the examiners. The fabrics were first tested using LIBS analysis followed by the color tests. Results show that LIBS can identify more elements used in modern ammunition and generate 3D-chemical images of the spatial distribution of FDR for more objective estimations of shooting distance