B136 A Method for the Analysis of Thermally Labile Components of Smokeless Gunpowder by Gas Chromatography/ Mass Spectrometry

Matthew C. Lovelace, BS, Vince Figarelli, BS, and Dawn Sy, BS, Arizona Department of Public Safety, 2102 West Encanto Boulevard, MD 1150, Phoenix, AZ 85009*

After attending this presentation, attendees will learn how thermally labile compounds found in smokeless gunpowder can be easily detected and identified without the additional cost of a PVT inlet.

This presentation will impact the forensic community and/or humanity by providing a convenient alternative to purchasing a PVT inlet for specific GC applications.

Typical Gas Chromatograph (GC) injection port temperatures can be as high as 250°C to completely volatilize some dissolved components of smokeless gunpowder. This is not desirable because at high temperatures some components become unstable, degrade, and can affect other compounds. This method allows for a lower inlet operating temperature and uses an instrument control macro to elevate the inlet and oven temperatures to purge the GC system prior to the subsequent sample injection. The increased temperature volatilizes components that are retained in the inlet at the lower operating temperature.

Agilent gas chromatographs are controlled by commands that are either sent to the instrument automatically, such as in a GC method, or by commands that can be input manually by the operator. The operator can either use the graphical user interface to enter commands, or the command line that is accessible at the bottom of the Chemstation window. The commands offered by the graphical user interface are limited and do not allow the invocation of all commands in the Chemstation environment. The macro in this method relies upon the use of the commands “IFTI” and “OVTI”, which control the injection port temperature and oven temperature respectively. By inserting the macro into the “instrument control macro” section in the GC method, commands are invoked that raise the inlet and oven temperature to 250°C and 290°C respectively and holds the temperature for a designated period of time. Then, both parameters are returned to normal operating temperature before the next sample injection.

While there are other options available for the analysis of thermally labile compounds such as capillary electrophoresis (CE) or High Performance Liquid Chromatography (HPLC), this method permits the analysis with little additional expense or equipment. The only disadvantage is the increase in sample run time due to the passive dissipation of heat from the inlet after the macro has run.

As a result, thermally labile compounds such as nitroglycerine (NG), diphenylamine (DPA), ethyl centralite (EC), methyl centralite (MC), dinitrotoluene (DNT), dibutylphthalate (DBP), and others can be easily detected and identified, which can assist in the discrimination between physically similar smokeless gunpowder.

Thermally Labile, Inlet, Smokeless Gunpowder

 ** Presenting Author*