B123 An Initial Report of the Arson Stable Isotope Analysis Project

John P. Jasper, PhD, Molecular Isotope Technologies, Inc.,*
8 Old Oak Lane, Niantic, CT; John S. Edwards, PhD, and Larry C. Ford, PhD, EFT Analytical Chemists, Inc., 2092 Erkin Smith Road, Nashville, NC; and Robert A. Corry, Fire and Explosion Investigation Unit, Massachusetts State Fire Office, Boston, MA

The goal of this presentation is to inform the forensic community about the potential usefulness of naturally-existing stable isotopic tracers that occur in arson-related accelerants recovered from crime scenes and on putative arsonists' clothing or in accelerant containers, allowing an evidentiary connection between potential arsonists and crime scenes.

Compound-specific isotope analysis (CSIA) was developed to trace the provenance of individual hydrocarbons in natural petroleum samples. Arson-related accelerants are largely composed of mid-range hydrocarbons, including alkylbenzenes, napthalenes, *n*-alkanes, *etc*. It is suggested that CSIA can be performed on accelerant samples from suspected arson-crime scene sites and from the personal belongings of putative arsonists and/or accelerant containers permitting a causal connection to be made between the suspect and the crime scene.

Stable isotope analyses has been performed under three conditions of evaporation-combustion: (i) Control accelerant: 0% evaporation 87 octane, (ii) Moderately-(50%)-evaporated gasoline in fire debris: petroleum-ether washing (ASTM E 1386) of 20 ml of 50%-residual gasoline extracted from burned carpet and padding, and (iii) Severely(90%)-evaporated accelerant in fire debris: dynamic headspace separation (ASTM E 1413) and concentration of 10 Ol-residual gasoline extracted from burned carpet and padding. Initial results for the 50%- evaporation experiment show relative small (~0.5-1.3‰) and generally consistent ^{13}C-enrichment in the residual gasoline compounds, while the 90%-evaporation results generally span from ~0.3‰ depletion to ~1.3‰ enrichment. A recent report on the stable isotopic composition of petroleum hydrocarbons and included references (Pond *et al*., 2002, *Envir. Sci. Technol*. 36:724-728) emphasizes the resistance to isotopic fractionation (*i.e*., 'tracer stability') of carbon isotopes relative to hydrogen isotopes under natural conditions. Well-controlled evaporation-fractionation experiments on individual organic compounds encourage further research into the behavior of complex accelerant mixtures under varying degrees of evaporation and burn conditions.

Stable Isotopes, Arson, Profiling

 ** Presenting Author*