B128 Advances in the Smoke Odor Analysis in Fire Investigations

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After attending this presentation, attendees will have been presented with data illustrating how smoke odor analysis can be used in arson and homicide investigations and to allow the delegate to develop an appreciation of a new forensic tool.

This presentation introduce a new forensic tool.

Smoke odor comprises a variable range of individual volatile organic compounds (VOCs), which can be present above or below published odor thresholds. The detailed distribution of VOCs in the vapor phase depends upon the particular combination of materials being pyrolysed in the fire in question, for example wood, polystyrene, polyolefins, polyurethanes, polyesters, PVC, nylons, methacrylates, tissue and various accelerants. The VOC products in question can accumulate efficiently on both adsorbent materials at the scene of the crime and on the clothing and hair of a suspect exposed for a period to smoke from the fire in question. They can then be detectable organoleptically by both scene of crime and arresting officers.

The adsorbed pyrolysis products are amenable to established headspace analytical procedures, involving concentration from sealed nylon pouches onto conditioned Tenax porous polymer and thermal desorption/GC-MS analysis. Approximate quantification allows comparison with an extensive database of odor thresholds. Pyrolysis-EIMS analysis of materials from the scene of the crime can be used as a validation procedure to verify the probable source(s) of volatile products in question.

The pyrolysis products are present in smoke at typically ppb concentrations. Much care needs therefore to be devoted to data interpretation and the selection and analysis of appropriate control samples. Although the TD/GC-MS methodology is similar, this presents a significantly more challenging analytical requirement than typically encountered in the detection and characterization of accelerant residues on fire debris samples.

The M-Scan smoke odor method will be described and illustrated by reference to (a) the first English criminal case in which this approach has been used to tentatively link a suspect to a particular fire, and (b) a series of controlled combustion experiments involving known combinations of materials.

Pyrolysis, Smoke, Odor