

Highlighting and identifying petroleum distillates into fire-charred residues

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Introduction

Petroleum fractions are present in a lot of products, like plastics or ignitable products. In case of arson, these petroleum fractions may inquire about the products present on the fire scene. The Forensic Sciences Institute of the French Gendarmerie and more specifically the arson unit analyzes fire-charred residues. These analyses allow experts to identify the possible presence of Ignitable Liquids Residues (ILR). The presence of ILR can prove a fire was criminal if this presence is not justified. These ILR could be constituted of one or more petroleum distillates. Therefore, highlighting the petroleum distillates allows the experts to identify one product.

Experimental conditions

The highlighting and detection of petroleum fractions were split in two parts. First, the light petroleum distillates were highlighted by gas chromatography coupled to a flame ionization detector, and identified by gas chromatography coupled to a mass spectrometer. Both techniques utilized a headspace mode. Samples were heated and light to medium petroleum distillates vapors were collected in a vial. These vapors were injected into a chromatograph. In a second step, heavy petroleum distillates were extracted from a matrix using an organic solvent. The solution was evaporated under a nitrogen flow. Moreover, the compounds of interest were highlighted and identified by gas chromatography coupled to a flame ionization detector and then a mass spectrometer. The petroleum fraction contained mainly a lot of apolar compounds so the columns used were apolar and two temperature gradients were used: one for the light and another for the heavy fraction.

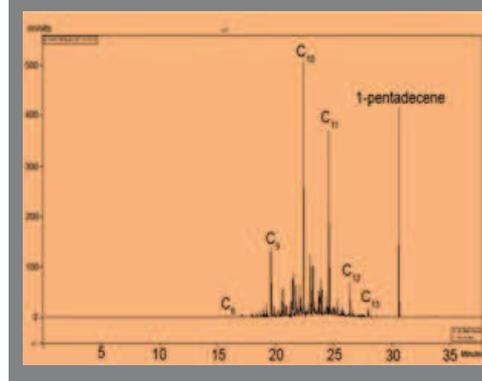
Results

After analyses, a chromatogram was obtained. On the figure, the 1-pentadecene was the internal standard. It confirmed that the extraction occurred. This profile was typical of a white spirit fraction, although the analyzed product was wood furniture treatment. Indeed, more fractions can be used for one application however; the same fraction can be used for different applications. The arson unit has a database of flammable materials reference that is a decision-making tool. This library allows technicians to compare the profile of sample to reference profiles and thus to identify the potentially flammable products. To be effective, the database must be as complete and current as possible.

Conclusion

Highlighting and identifying petroleum distillates, is a long process. Determining the product that contains these petroleum fractions is made easier by using a library. This library will be incremented with ignitable products available to the public.

Chromatogram of wood furniture treatment by headspace gas chromatography



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