

RECOMMENDATIONS / LABORATORY CONSIDERATIONS

Based on an examination of experimental data from the biologically degraded ignitable liquid studies, the Ignitable Liquid Reference Committee (ILRC) recommends setting a threshold limit for accepting data as positive. This threshold will be different and dependent on each laboratory's procedures and instrumentation. Based on the instrument used to collect data at the National Center for Forensic Science, the threshold selected by the ILRC members was 15,000 to 20,000 counts in the total ion chromatogram. It was determined that below this threshold, there was not sufficient mass spectral data available to confirm individual peak identification. Even though some extracted ion profiles appeared to be recognizable, the committee was unable to verify individual components. Patterns with very few components often required the higher threshold while patterns with many components and a complex pattern could often be determined using the lower threshold. Regardless of the threshold, the committee has developed a criterion of making a negative determination if there is not sufficient conclusive evidence of the presence of an ignitable liquid.

Caution must be exercised when reviewing Total Ion Chromatogram data that is at a very low level. Extracted ion profiles (EIP), by filtering away some of the less desirable compounds from the TIC, will sometimes produce what appears to be an EIP pattern comparable to a reference standard. However, comparison of only the retention time patterns of peaks from EIP from the debris sample to a reference standard is not enough on which to base a positive determination. The mass spectra of target compounds must be examined. If, due to the levels of their concentration or presence

of co-elutants, the mass spectra are not sufficiently clear, the analyst should opt for a negative determination.

The ability to make a positive determination on a biologically degraded ignitable liquid is dependent on the compounds remaining from the parent liquid, the lower threshold for the instrument, and the comparison of the unknown against an ignitable liquid standard degraded under controlled conditions. The degree and pattern of degradation for ignitable liquids is affected by:

- The abundance of microbes in the sample
- The types of microbes in the sample [9]
- Ability of the microbes to adapt to different food sources [3]
- The amount of ignitable liquid in the sample
- The time the microbes and ignitable liquids are in contact
- The temperature of the sample over time [2]
- The moisture content of the soil or other organic matrices [3]
- The soil type [4] [5]

The records in this database do not represent all possible results for microbial degradation. The committee urges the users of this database to obtain a comparison soil (if possible) and spike it with the suspected ignitable liquid to approximate what was found in the debris sample. Analysts should note the date of the incident and take measures to retard microbial growth prior to sample extraction. Major degradation in this study occurred most often by day 7. There are references and suggested readings

for the user at the end of this guide. Some of the variations seen may also relate to individual laboratory protocols. Any positive determination of the presence and identification of an ignitable liquid requires a combination of the total ion chromatogram, the appropriate ion profiles, and the mass spectra of key compounds. Chromatographic patterns are not sufficient by themselves to confirm that an ignitable liquid is still identifiable after being deteriorated or degraded. Confirmation of components and target compounds by extracted ion chromatograms, mass spectra and library matches must be used to confirm the ignitable liquid.

CAUTION – DO NOT make any identification of a target compound by retention time alone.

Prior to extraction, the method commonly used to retard microbial degradation of ignitable liquids in fire debris is to refrigerate or freeze them. During extraction, microbes are affected by heat and may be completely destroyed depending on the time and temperature utilized. However, the tolerance for heat is not the same for all microbes [2]. The passive headspace extraction method for fire debris usually progresses with the sealed containers being heated for 12 to 16 hours at 60 to 85° C. This may be sufficient to kill microbes present in the debris as some studies indicate that they are destroyed in a logarithmic process where the time is a more significant factor than temperature in their destruction [2]. Further studies on this subject may be warranted.

When performing a search in the database for a particular product, the initial screen may have a link for “Related Samples”. This “Related Samples” link takes the user to a screen where the neat liquid and all available biologically degraded and weathered total ion chromatograms for that sample are shown. The list can be further sorted to show only the weathered or biologically degraded samples as compared to the original product. This allows the user to see the progression of the loss of components from the parent product to the most affected sample. Click here to [hyperlink an example](#) in the database.