



Jones Environmental Forensics

Biomarker Analysis

Biomarkers are a group of compounds, primarily hydrocarbons, found in oils, rock, sediment and soil extracts. Biomarkers are sometimes called “molecular fossils” as they retain all or most of the original carbon skeleton of the original natural product. Biomarker molecules are particularly resistant to microbial attack, and as the ratio of the biomarkers to other hydrocarbon components decreases as the oil degrades, they are very useful in determining the source of spilled oil, differentiating oils, and monitoring the degradation and weathering state of oils under a variety of conditions. The distribution pattern of biomarkers generally differs between oils.

Most knowledge of biomarkers and their diagnostic ratios comes from oil geochemistry and a wide variety of biomarkers have been identified as being of use in the characterisation of crude oils and oil fractions. However, although a wide range of biomarkers can be used for correlation, the ones most appropriate to environmental forensics are hopanes (191 m/z), triaromatic steranes (m/z 231), and sesquiterpanes (m/z 123). The isoprenoids pristane and phytane can also be used as biomarkers as well as for age determination (see separate flyer), however as the ratio can be affected by many factors it is not used as a major correlation parameter.

Hopanes – m/z 191

Hopanes are C₂₇-C₃₅ pentacyclic alkanes and are found in almost all ancient sediments and crude oils and are generally derived from bacteria.

Triaromatic steranes – m/z 231

This group of biomarkers are normally found in petrogenic oils such as crude oils but are removed in lube oils and middle distillates during the refining process. By targeting this group of compounds, it is possible to distinguish between refined lube oil and a heavy fuel/bunker fuel.

Sesquiterpanes – m/z 123

This group of biomarkers found in the range C₁₃-C₁₇, are useful for correlating lighter petroleum products such as kerosenes and diesels. They are derived from higher plants and resins, essential oils and some bacteria.

Isoprenoids – pristane and phytane

Pristane - IP₁₉ and phytane IP₂₀ are branched alkanes which are derived from the chlorophyll molecule under differing conditions, and are ubiquitous in most oil and sediment extracts making them one of the most important biological markers particularly for estimating age.

For further information please contact us via our website: www.jones-forensics.com

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