CREOSOTE CONTAMINATION

TECHNICAL BULLETIN

A Tiered Approach to Positive Identification

For customers who suspect they have a creosote contamination problem, this bulletin provides concentration ranges of major components and an overview of Maxxam's tiered approach to analysis and identification of suspected sources.

Creosote is a fungicide, insecticide, and sporicide used as a wood preservative for above and below ground wood protection treatments as well as for treating wood in marine environments. Creosote wood preservatives are used primarily to pressure treat railroad ties/crossties and utility poles/crossarms. (Source: National Pesticide Information Centre, article: CREOSOTE HUMAN RISK CHARACTERIZATION)

Background

Creosote is a complex mixture of aromatic and heterocyclic organic compounds obtained from the fractional distillation of coal tar. Identification can be difficult, because, depending on the source, the composition of the creosote can vary widely. Also, in the environment, volatilization of the lighter components and leaching of the more soluble compounds will further alter the composition.

Typical concentration ranges of the major components in neat creosote are listed in the table below:

Class	Subclass	Range
Aromatics	PAH & alkylated PAH	30% - 90%
	BTEX, MAH	1% - 5% (Present in fresh creosote. Typically not found in weathered product)
Non-Chlorinated Phenols	Phenols, cresols, xylenols, napthols	3% - 17%
O - heterocyclics	Dibenzofurans	5% - 8%
N - heterocyclics	Pyridines, quinolines, acridines, benzoquinolines, indulines, carbazoles	4% - 9%
Aromatic amines	Aniline, amino PAH	1% - 3%
S – heterocyclics	Benzothiophenes and derivatives	1% - 3%

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Maxxam is the Canadian market leader in analytical services and solutions to the energy, environmental, food and DNA industries and a member of the Bureau Veritas Group of companies – a world leader in testing, inspection and certification services. We support critical decisions made by our customers through the application of rigorous science and the knowledge and expertise of our over 2500 employees.

If you suspect creosote contamination, please contact your Maxxam account manager to discuss appropriate next steps.

You are also invited to consult with Maxxam's resident experts on this topic:

Barry Loescher, PhD, PChem, Quality Systems Specialist or **Terry Obal**, Ph.D., MCIC, C.Chem. Director, Scientific Services and Development.

In the environment, the more water soluble compounds (BTEX, non-chlorinated phenols, heterocyclics) will tend to leach into the groundwater, thus analysis of creosote contaminated groundwaters would tend to have a higher percentage of these compounds relative to the neat creosote. Soils would have higher percentages of the heavier polycyclic aromatic hydrocarbons (PAH) and alkylated PAH. In addition, pentachlorophenol (PCP) may be present as it was often added to creosote to enhance the wood preserving capability.

Analysis of Creosote

Because of the complex and changing nature of creosote in the environment positive identifcation is not a simple process and quantitation is even more challenging. In response, Maxxam has developed a tiered approach to providing analytical services which we believe provides best value to the customer.

IMPORTANT NOTE: Often these projects want to identify a source for the creosote contamination. In such cases, samples of the suspected source are essential.

Maxxam's Recommended Approach

Phase 1:
Perform a hydrocarbons analysis (F1/BTEX and F2-4) and determine if the chromatographic trace matches other contaminants commonly found in environmental samples (e.g. gasoline, diesel fuel, furnace oil, transformer oil, lubricating oil). If it does, it may be possible to rule out creosote.

Phase 2:
Analyze for target and alkylated polycyclic aromatic hydrocarbons (PAH) and non-chlorinated phenols. These are the major components in creosote and presence of both classes of compounds is a good indication of creosote. Also, creosote itself is not regulated but several of the target compounds are.

Phase 3:
If the levels detected in phase 1 are > 10x RDL, perform an open scan GC/MS analysis on the extract. This will detect any additional creosote marker compounds present such as dibenzofuran andaromatic amines. If samples are < 10x RDL, this test is not sufficiently sensitive to provide useful data and is not recommended.

Perform an aliphatic/aromatic fractionation using silica gel and analyze both fractions by GC/FID. If the sample contains only aromatics, combined with the previous data, this is a strong indication that creosote is present and virtually eliminates a petrogenic source.

Phase 4:
If further confirmation and / or a written opinion is required, there are several other techniques that could be employed such as pattern matching with suspected sources. Discussion with Maxxam experts is recommended.

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