



NSO-HETEROCYCLIC COMPOUNDS IN GROUNDWATER

YOUR PLUS IN COMPETENCE IN ENVIRONMENTAL ANALYSIS

AGROLAB played a material role in developing the new DIN 38407-44. The new standard includes a standardised procedure for the analysis of NSO-heterocyclic compounds. These compounds are toxic and are therefore hazardous to the health of humans, animals and to the environment. These compounds gain infiltrate our ground water via soil contaminated with tar and creosote.

As an environmental analytics service provider, AGROLAB has been supporting the remediation of pertinent contaminated sites, such as e.g. gas plants and coke oven plants. Our laboratories have gained extensive expertise with corresponding references in this field.

A few years ago, the research project KORA for natural attenuation (NA) of contaminations at contaminated sites was carried out. The focus of the project was on developing modern remediation methods for such sites.

In the course of the project, it was found that PAHs were detected in significant concentrations in the soil of pertinent sites contaminated with creosote; however, the frequent main contaminants in the corresponding ground water were NSO-heterocyclic compounds.

Even in the currently applicable German Federal Soil Protection and Contamination Ordinance, a note on the significance of this substance class is rightly included. For the exposure pathway of soil to ground water of the German Federal Soil Protection Act, there is an explicit note on the significance of possible further relevant substances, e.g. quinoline, within the scope of the test value "PAH total". In addition, the currently defined thresholds for insignificance according to the Länderarbeitsgemeinschaft Wasser (German federal state work committee for water, LAWA) in the ground water must be considered in the NSO-heterocyclic compound assessment.

Due to the corresponding toxicity of the NSO-heterocyclic compounds, they have become increasingly the focus in the last few years, which is why the demand for their analysis has been growing steadily.

- many years of experience as an environmental analysis service provider in the remediation of pertinent contaminated sites
- Significant participation in the development of DIN 38407-44
- Extensive offer in environmental analysis
- Modern and redundant equipment for fast and punctual analysis
- Nationwide sample logistics
- Professional and individual support by our sales department as well as our customer service in the lab
- ALOORA: Our online platform for direct commissioning, processing and reporting of your analysis
- Delivery of water containers according to DIN EN ISO 5667-3

AGROLAB is one of the first private laboratories accredited according to the standard fresh off the press.

Until now, there was no standard for the analysis of the toxic NSO-heterocyclic compounds

Even though the importance of analysing these substances has increased significantly in the last few years, there was no standard for the analysis of these components until now.

Due to the lack of standardised analytical methods, the laboratories developed their own internal methods.

This frequently caused issues regarding the comparability of the results. This was one of the reasons why the evaluation of analysis results being too complex for the relevant decision-makers.

THE NEW STANDARD DIN 38407-44 REGULATES THE ANALYSIS OF NSO-HETEROCYCLIC COMPOUNDS

The publication of DIN 38407-44 in February of this year changed this. There is now a standardised procedure describing the analytics of this substance class by means of GC/MS after saturation of the water sample by SPE (solid phase extraction).

This was achieved thanks to the contribution of our experts together with other leading specialists for research and routine analytics in this field.

In addition to the analytics, this standard also provides for the individual compounds to be analysed. The list of analytes included hereunder was aligned with the suggestion for suitable priority substances stemming from a research project subsidised by the Länderarbeitsgemeinschaft Boden (German federal states work committee for soil, LABO) and will therefore gradually replace all lists of analytes currently in circulation in the future.

AGROLAB LABOR GMBH IS ONE OF THE FIRST PRIVATE LABORATORIES ACCREDITED PURSUANT TO THE PASSED DIN 38407-44 STANDARD

AGROLAB Labor GmbH is one of the first private laboratories in Germany accredited according to the standard fresh off the press. The scopes of analyses meets almost all parameters presented in the new standard and are available to our customers as of now.

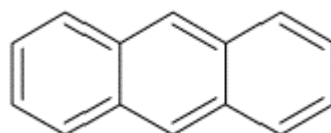
What does the term "NSO-heterocyclic compounds" refer to?

The group of NSO-heterocyclic compounds can be found in relevant concentrations in the ground water of sites contaminated by tar/creosote or mineral oil based products (e.g. former coke oven plants, gas plants, business processing creosote/mineral oil) in particular. This compound is a mononuclear or polynuclear cyclic hydrocarbon compound in which at least one atom in the carbon ring was replaced by a nitrogen, sulphur or oxygen atom.

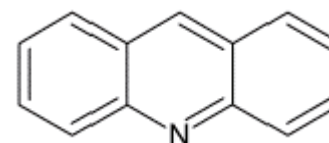
Increased occurrence of NSO-heterocyclic compounds in the ground water due to easy solubility in water

In contrast to the associated polycyclic aromatic hydrocarbon compounds (PAHs), NSO-heterocyclic compounds are significantly more soluble in water and more mobile with regard to their passing into the ground water. The cause is a significant increase of polarity in the presence of N, S, O atoms in the ring structure and thus lower adsorption by the soil.

For example, anthracene (a member of the 16 EPA PAH list) has a solubility of 0.05 mg/l in water. acridine (one of the NSO-heterocyclic compounds), however, has a solubility of 38 mg/l in water.

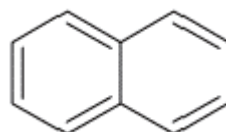


Anthracen

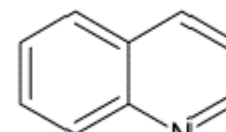


Acridine

Naphthalin, der mit Abstand mobilste PAK-16-EPA Liste Vertreter, weist eine Wasserlöslichkeit von 33 mg/l auf. Die Wasserlöslichkeit des NSO-Heterozyklus Chinolin beträgt zum Vergleich 6.500 mg/l.



Naphthalene



Quinoline

AGROLAB IS PERFECTLY EQUIPPED FOR ANALYTICS OF NSO-HETEROCYCLIC COMPOUNDS

ANALYTE	UNIT	LOQ	STANDARD	GFS	LABO PROJECT PRIORITY SUBSTANCES	DIN 38407-44
N-containing						
1-methylisoquinoline	µg/l	0.1	DIN 38407-44: 2018-02			
2,4-dimethylquinoline	µg/l	0.1	DIN 38407-44: 2018-02		✓	✓
2,6-dimethylquinoline	µg/l	0.2	DIN 38407-44: 2018-02	✓		✓
2-methylquinoline	µg/l	0.1	DIN 38407-44: 2018-02	✓		✓
6- and 7-methylquinoline	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓
Acridine	µg/l	0.08	DIN 38407-44: 2018-02	0.08	✓	✓
Carbazole	µg/l	0.2	DIN 38407-44: 2018-02	0.2	✓	✓
Quinoline	µg/l	0.01	DIN 38407-44: 2018-02	0.01	✓	✓
Indole	µg/l	0.2	DIN 38407-44: 2018-02	✓	✓	
Isoquinoline	µg/l	0.1	DIN 38407-44: 2018-02	✓		✓
Phenanthridine	µg/l	0.1	DIN 38407-44: 2018-02			
O-containing						
2,3-dimethylquinoline benzofuran	µg/l	0.1	DIN 38407-44: 2018-02	0.3	✓	✓
2-methyldibenzofuran	µg/l	0.1	DIN 38407-44: 2018-02		✓	✓
2- and 3-methylbenzofuran	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓
Benzofuran	µg/l	0.1	DIN 38407-44: 2018-02	1.8	✓	✓
Coumarin	µg/l	0.1	DIN 38407-44: 2018-02	4.7		✓
Dibenzofuran	µg/l	0.1	DIN 38407-44: 2018-02	0.4	✓	✓
Xanthene	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓
S-containing						
2-methyl benzothiophene	µg/l	0.1	DIN 38407-44: 2018-02			✓
3, 5-dimethyl benzothiophene	µg/l	0.1	DIN 38407-44: 2018-02			
3-methyl benzothiophene	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓
4-methyl benzothiophene	µg/l	0.1	DIN 38407-44: 2018-02			
5-methyl benzothiophene	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓
Benzo(b)thiophene	µg/l	0.1	DIN 38407-44: 2018-02	0.3	✓	✓
Dibenzothiophene	µg/l	0.1	DIN 38407-44: 2018-02	✓	✓	✓

Within the scope of a LABO project (B 2.11 – module 3), a list of priority substances to be analysed was suggested which can be covered in full with the standard at hand.

This gives AGROLAB everything it needs to meet the stipulated requirements

In addition, further mononuclear heterocyclic compounds and some selected transformation products of this substance group can also be analysed in our laboratory.

For more information and an offer, please feel free to contact our sales team if needed. You can also directly contact our customer service in the laboratory at any time.