

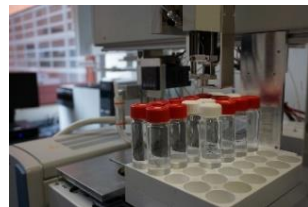


Compound-specific Isotope Analysis for Contaminant Source Characterization

The compound-specific analysis of stable isotopes (CSIA), especially for multiple elements, provides an isotopic fingerprint ($^{13}\text{C}/^{12}\text{C}$, $^2\text{H}/^1\text{H}$, $^{37}\text{Cl}/^{35}\text{Cl}$ given as delta notation: $\delta^{13}\text{C}$, $\delta^2\text{H}$, $\delta^{37}\text{Cl}$) of organic contaminants, with which different sources or contamination events can be distinguished. In addition, different production periods of CVOCs (pre-1940s, 1940s to 1980s, post-1980s) correspond to specific $\delta^{13}\text{C}$ - and $\delta^2\text{H}$ -values, respectively. This allows a chronological classification of the contamination event.



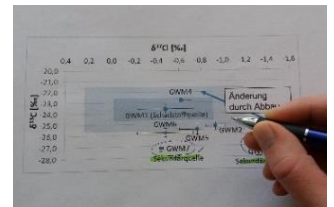
Sampling



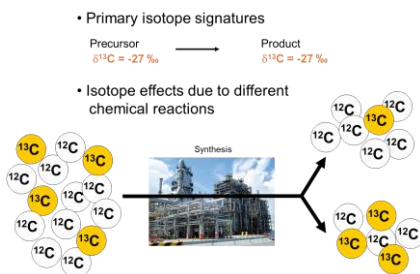
Preparation



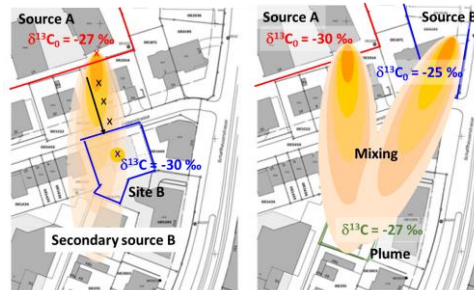
Analysis



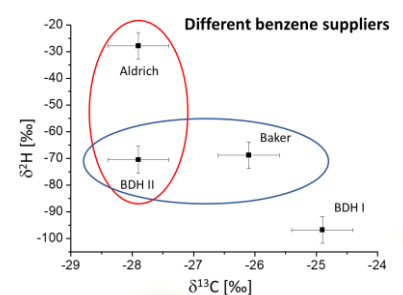
Expertise



The isotope ratios of organic pollutants exhibit specific ranges, because the synthesis methods of the manufacturers differ or their precursors have different origins.



At sites with isotopically different sources of contamination, it is possible to assign a pollutant plume to a specific source and to derive mixing proportions.



Compound-specific isotope analysis of multiple elements can enable clear differentiation of pollutant sources and thus more accurate causation.

Workflow

- In a joint concept, we select target contaminants and spots of the field site to be investigated.
- We provide sampling flasks and protocols to our clients, who send the samples to our laboratory.
- We analyse stable isotope ratios of the target pollutants.
- We interpret the isotope data to identify pollutant sources and assign polluters.

Outcome

Differentiation of pollutant sources
Assignment of polluters

Costs

$^{13}\text{C}/^{12}\text{C}$, $^2\text{H}/^1\text{H}$: 250 - 320 € per sample
 $^{37}\text{Cl}/^{35}\text{Cl}$: 320 - 450 € per sample
 $^{15}\text{N}/^{14}\text{N}$: 320 - 450 € per sample

Further reading

Philp RP (2007) The emergence of stable isotopes in environmental and forensic geochemistry studies: a review. Environ. Chem. Lett. 5: 57-66.

Buczynska AJ, Geypens B, Van Grieken B, De Wael K (2013): Stable carbon isotopic ratio measurement of polycyclic aromatic hydrocarbons as a tool for source identification and apportionment - A review of analytical methodologies. Talanta 105: 435-450.

Ivdrá N, Fischer A, Herrero-Martin S, Giunta T, Bonifacie M, Richnow HH (2017): Carbon, hydrogen and chlorine stable isotope fingerprinting for forensic investigations of hexachlorocyclohexanes. Environ. Sci. Technol. 51: 446-454.

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