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Proficiency Tests for PAHs in Surface Water for EU-WFD Monitoring Including Real Suspended Solids

Background

- EU Water Framework Directive requires analysis of organic trace compounds in whole water samples, i.e. including suspended solids
- This dramatically increases the difficulty of analysis for compounds like PAHs that strongly adsorb on particles
- Realistic PT samples should therefore contain real suspended solids

Challenges to prepare realistic PT samples

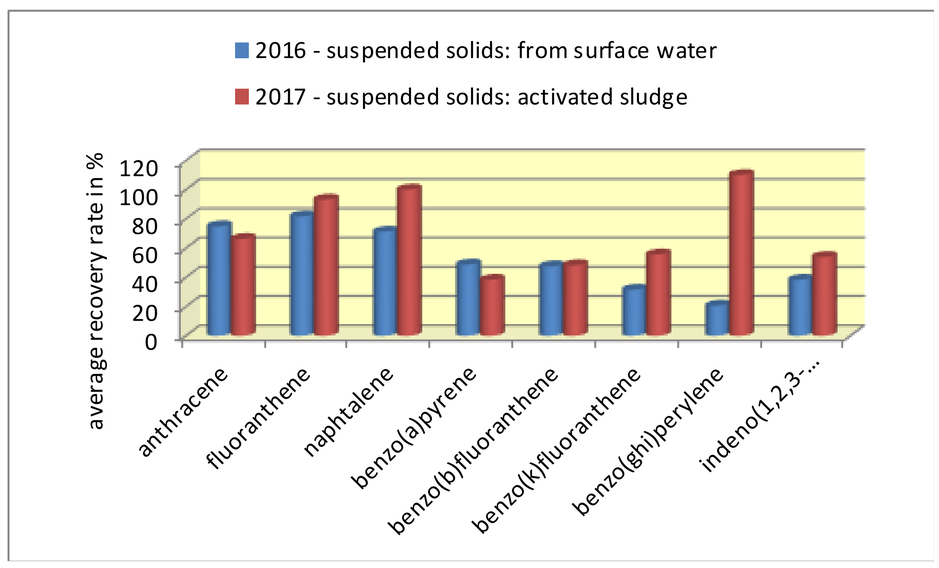
- Usually high content of organic matter in the suspended particles in surface water (algal growth or particles from waste water treatment)
  → Resuspended sediments usually contain less organic matter and therefore are not suitable
- It is to be expected that participants' results are, on average, biased
  → The use of a consensus value is strongly discouraged and a reference value has to be determined in a different way

Design of the AQS BW PTs

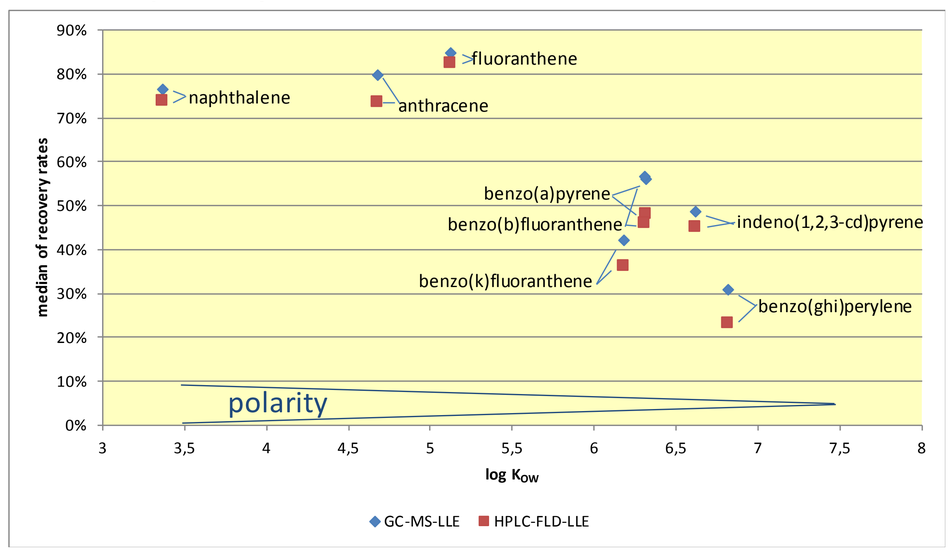
- Two PTs have been organized for PAHs with suspended solids
- Suspended solids isolated with a continuously working centrifuge from
  1. surface water (mainly algae)
  2. waste water treatment plant effluent (activated sludge particles)
- Preparation of samples by spiking filtered surface water with
  - stock solutions of PAHs
  - suspensions of isolated particles

Recovery rates

- Good recovery rates for the low-condensed PAHs like Naphthalene, Anthracene etc., but
- Very low recovery for most of the higher-condensed ones



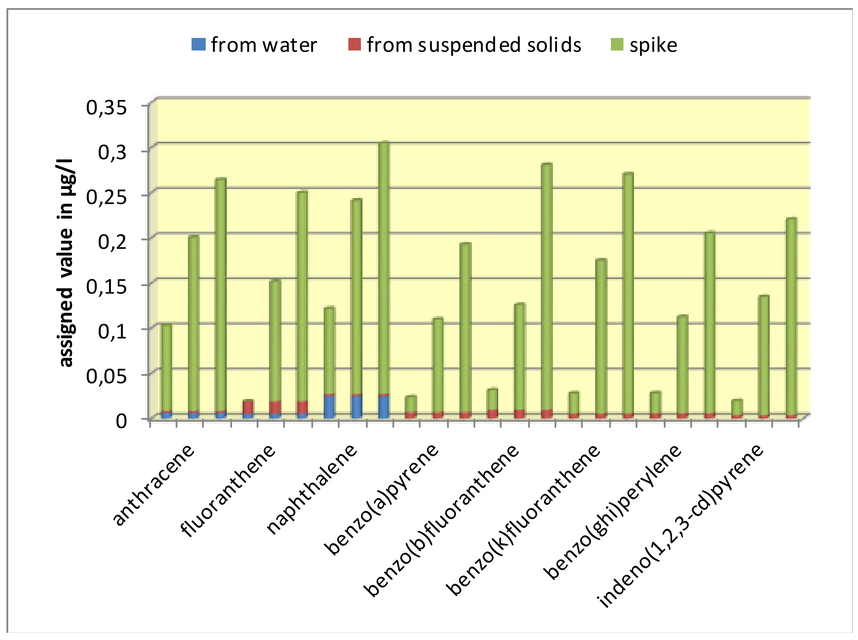
- In one of the PTs a method-specific evaluation of recovery rates vs. polarity of substances was made



Assigned values

calculated from

- content resulting from spiking with stock solutions (in the fig. green)
- blank values from the water (in the fig. blue)
- content resulting from the isolated particles that were previously characterized using Soxhlet extraction followed by GC-MS analysis (in the fig. red)



Conclusions

- A new way of preparing water PT samples with realistic suspended solids was developed
- Traceable assigned values to a high degree independent from analytical methods could be determined
- Generally low recovery rates, probably due to low extraction efficiency
- Average recovery rates depend on polarity of substances - the lower the polarity the lower the extraction efficiency
- Slightly better recovery rates for GC-MS compared to HPLC since some effects can be compensated with the use of isotope labelled internal standards

Acknowledgement

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