Removal of PM substances from drinking water by adsorption onto activated carbon

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Highlights

- some substances with very low log D (e.g. oxipurinol; log D = -3.37) show a high affinity towards AC
- log D appears to be a poor descriptor for adsorption prediction onto activated carbon
- adsorption onto activated carbon appears to be a suitable treatment option for some PM substances

Background

- PM substances are of growing concern due to their tendency to enrich in the water cycle and the risk of reaching drinking water
- little is known about their behavior in natural and technical water treatment processes

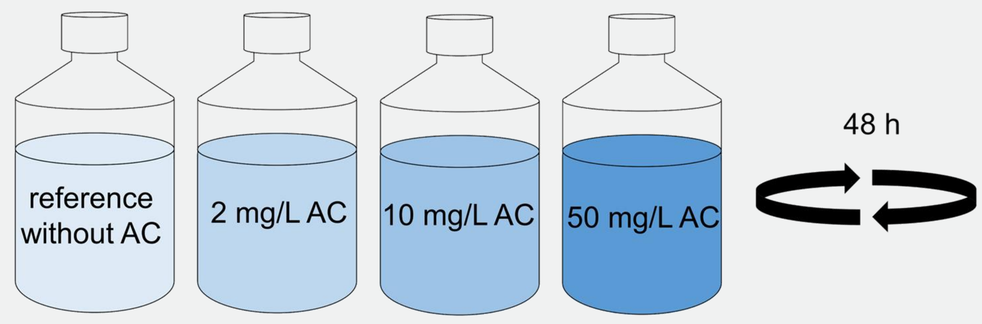
Are PM substances removed by activated carbon (AC) despite their high mobility (using log D as an indicator)?

- the affinity of a substance towards AC depends on polarity amongst others → low efficiency in case of mobile (polar) compounds is expected

Experiments

- batch experiments with pulverized granular activated carbon (Hydraffin CC, Donaucarbon)

Berlin tap water (pH = 8.3, DOC = 5.1 mg/L)
+
20 PM substances (c_0 ≈ 10 µg/L)

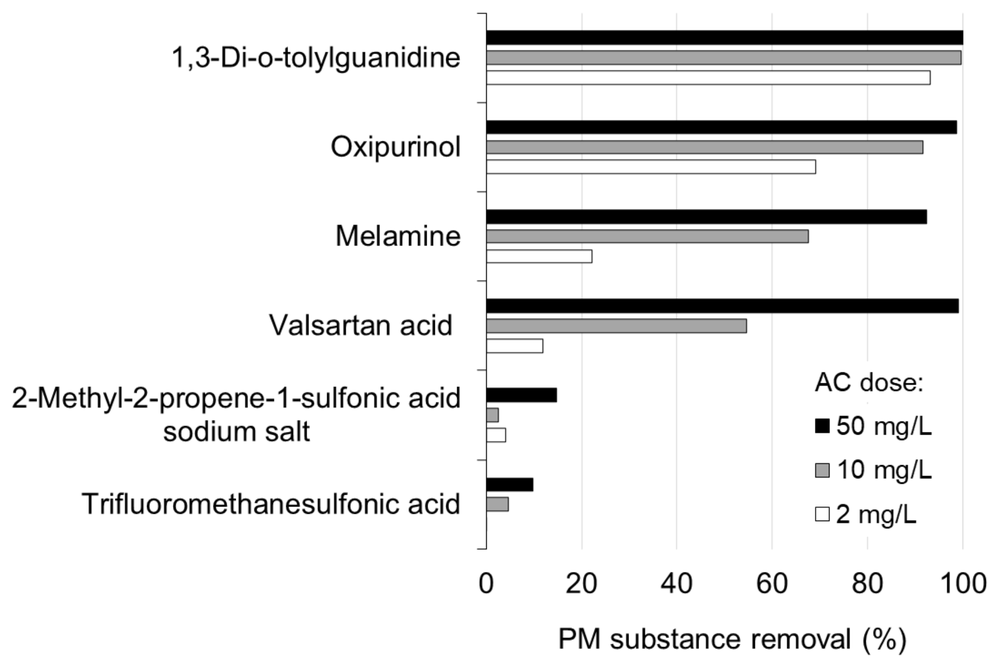


PM substance measurement

- pre-treatment by azeotropic evaporation
- supercritical fluid chromatography with high-resolution mass spectrometry (SFC-HRMS)
- removal calculation using peak area ratios

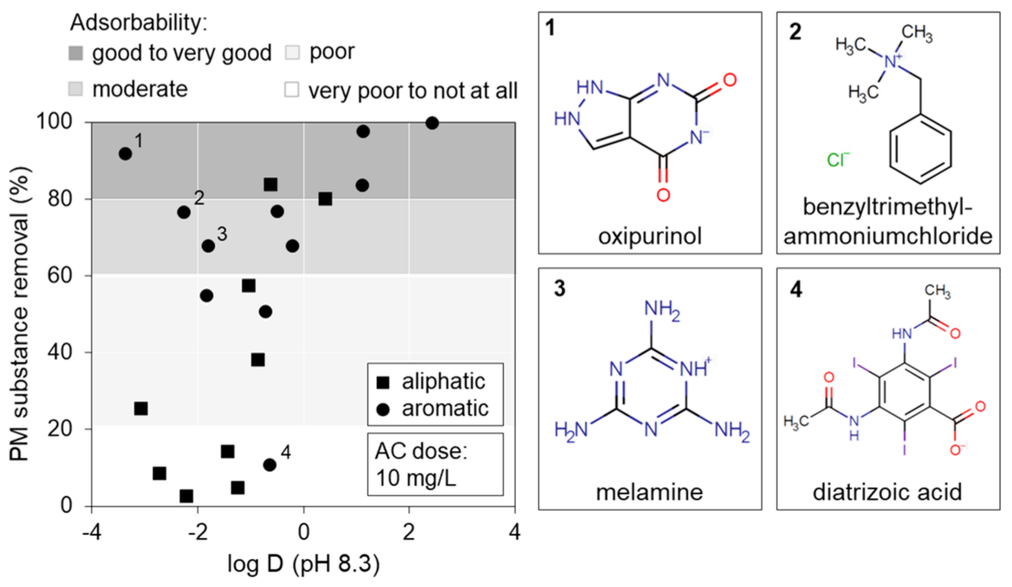
Removal by adsorption

- PM substances exhibit very different adsorbability onto activated carbon (selected substances are shown)



Classification and log D

- categorization of investigated PM substances according to their affinity towards AC at a realistic dose of 10 mg/L
- no correlation of affinity towards AC and log D visible, particularly for aromatic substances



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