CRC 1253 CATCHMENTS AS REACTORS

CAMPOS

Selective Extraction of Pesticides from Surface Water for Carbon Isotope Analysis using Crosslinked Cyclodextrin Polymers

David Glöckler, Rani Bakkour, Christopher Wabnitz and Martin Elsner

Chair of Analytical Chemistry and Water Chemistry, Technical University of Munich

Problem

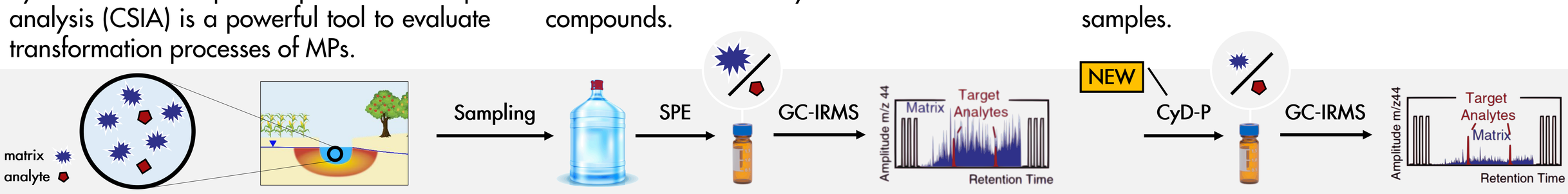
Organic micropollutants (MPs) are ubiquitously detected at CAMPOS research sites. Their fate is still poorly understood and difficult to elucidate by concentration dynamics. Compound-specific isotope analysis (CSIA) is a powerful tool to evaluate transformation processes of MPs.

Analytical Challenge

Low concentrations of MPs (i.e. ng/L) require enrichment from large volumes of water to meet low sensitivity of isotope-ratio mass spectrometry (i.e. mg/L). This leads to interferences caused by co-enriched matrix compounds.

Novel Approach

Crosslinked Cyclodextrin Polymers (CyD-Ps) used for SPE are hypothesized to encapsulate target analytes to form well-defined host-guest complexes resulting in selective extraction of MPs from water samples.



Do CyD-Ps extract MPs more selectively than commercial SPE sorbents?

SPE sorbents

tailor-made:	commercial:
α-CyD-P	OASIS HLB
β-CyD-P	LiChrolut EN
γ-CyD-P	Supel-Select HLB

Analytes

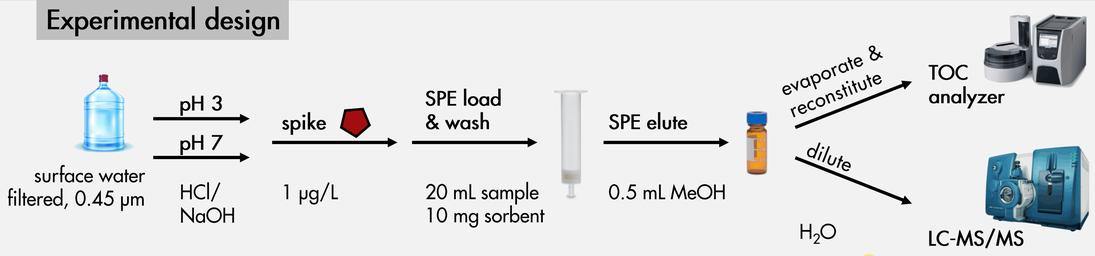
herbicides: atrazine, terbuthylazine, metamitron, s-metolachlor

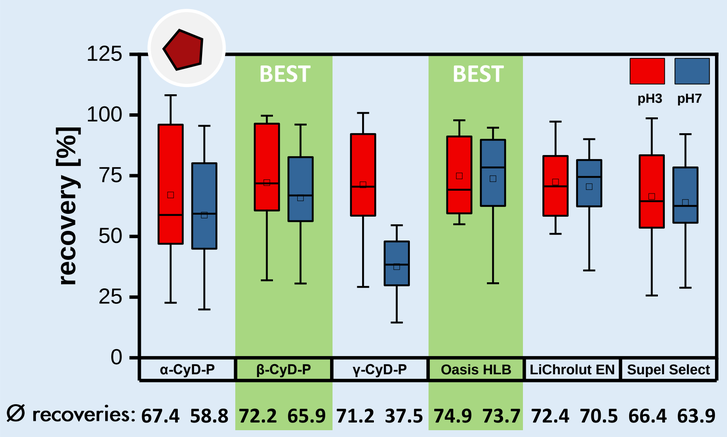
fungicides: azoxystrobin, boscalid, dimethomorph, propiconazole

insecticides: methiocarb, thiacloprid

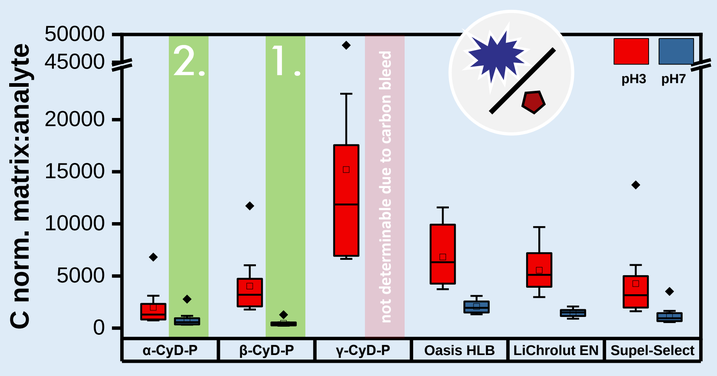
metabolite: 2,6-BAM

Experimental design





Comparable pollutant recoveries of CyD-Ps and commercial sorbents

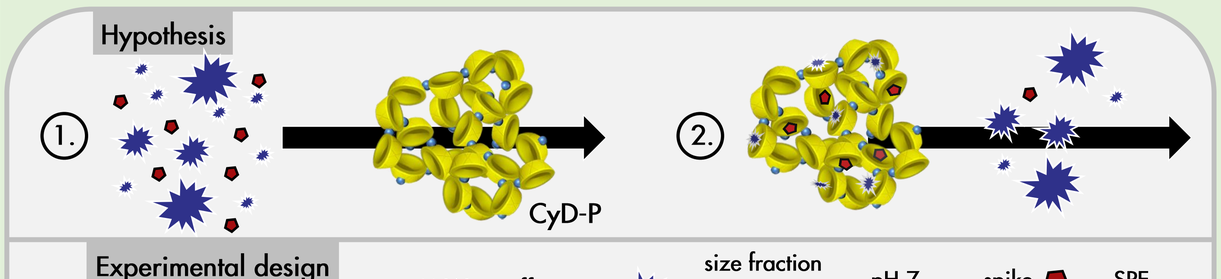


Sorption of MPs is up to six times more selective onto CyD-Ps!

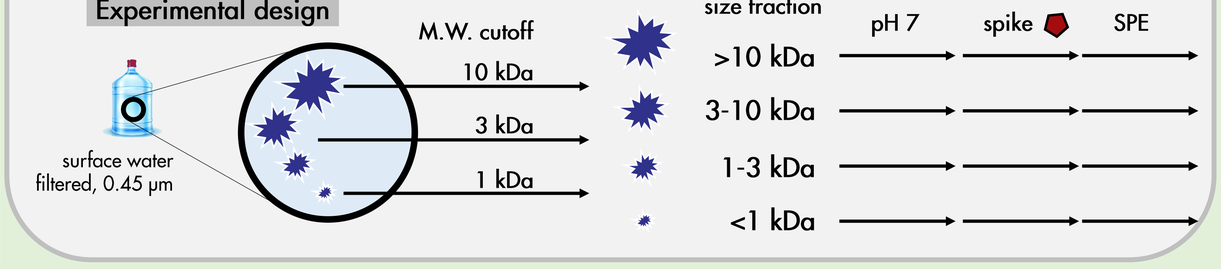
Extract at pH 7!!!

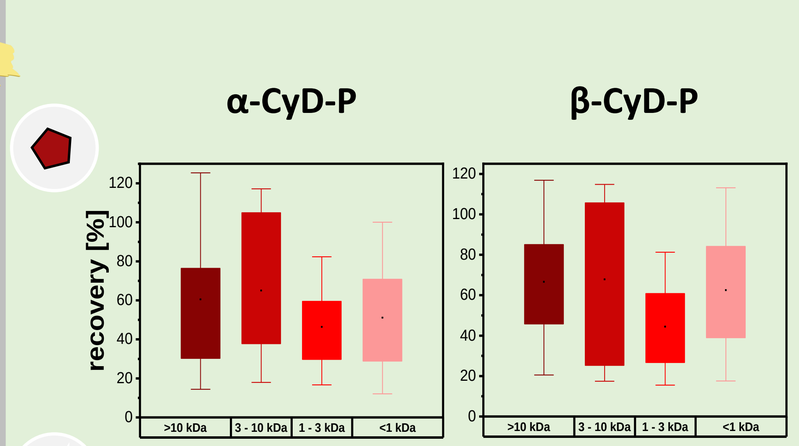
Size dependent sorption of NOM as driver for selectivity?

Hypothesis



Experimental design





Complementary sorption patterns suggest competitive sorption of MPs and NOM

Sorption of NOM does not show selective preference for smaller molecular sizes!

- CyD-Ps are promising sorbents for selective extraction of MPs
- In combination with analytical clean up steps, like prep. HPLC or MIPs, new horizons for CSIA applications may be offered.

To do:

- Elucidate drivers for selectivity by molecular level analysis of NOM
- Validation on GC-IRMS

Acknowledgement: This work was supported by the Collaborative Research Center 1253 CAMPOS (P2: Sub-Catchments), funded by the German Research Foundation (DFG, Grant Agreement SFB 1253/1 2017).
Contact: david.gloeckler@tum.de

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