A HYBRID CHEMOSENSOR MATERIAL FOR THE COLORIMETRIC AND FLUOROMETRIC DETECTION OF LONG-CHAIN CARBOXYLATES

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Background

Free fatty acids and their salts, long-chain carboxylates (LCCs), are ubiquitous chemical compounds and play a key role in many different areas concerning life at various levels such as[1–3]

- sensory and dietetic quality of food
- metabolic effectors and indicators
- diabetis and cardiovascular diseases
- quality and performance of industrial products
- water quality in aquifers

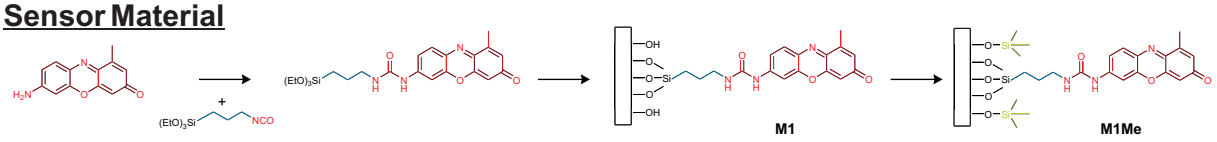
Aim

Development of the first chemosensor that allows to selectively determine LCCs in various liquid samples by amplified fluorescence signals.

Realization[4]

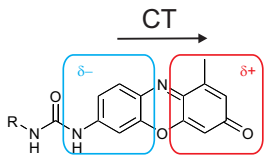
- Rational design of the molecular reporter and the signaling mechanism.
- Accomplishment of the selectivity features by incorporation of the reporter to an inorganic support and refunctionalization of the hybrid sensor material.

Sensor Material

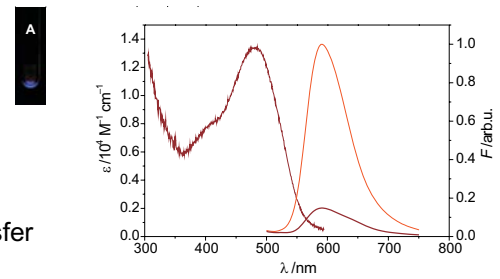


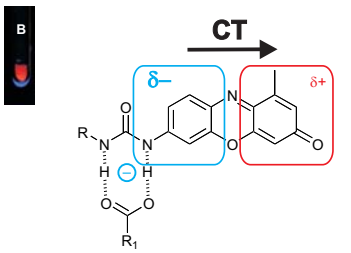
precursors of spacer + molecular probe | probe with appended anchor group | probe-functionalized mesoporous MCM-41 | trimethylsilyl-refunctionalized hybrid

Optical Response



unbound: weak charge-transfer fluorescene



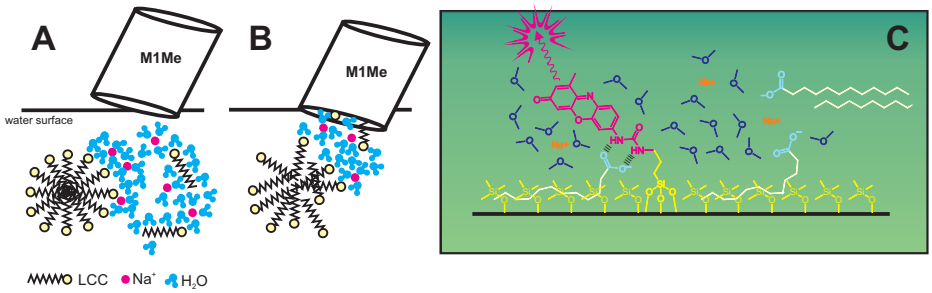


bound: strong CT fluorescence

Sensing Mechanism

A: Hydrophobic **M1Me** Floats on the liquid.

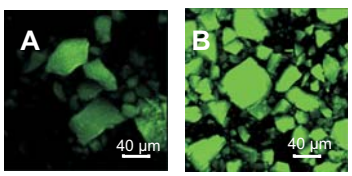
B: Uptake of LCCs, counterions and solvent leads to a suspension of **M1Me** in the solution.



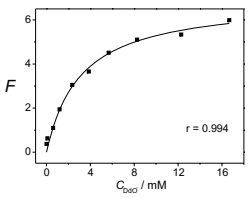
C: Hydrophobic forces "bind" the tail at the wall, hydrogen bonding to the urea group generates the signal.

Performance

- **M1Me** binds only LCCs of > C_{10} chain length.
- **M1** remains silent toward LCCs.
- Triglycerides, phospholipids, inorganic anions (e.g. phosphates), benzoic acid derivatives and cholates do not interfere.



Increase in CLSM fluorescence signals after adding oleate to **M1Me** in aqueous solution.



Typical titration curve

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References

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Acknowledgements

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