Electrochemical Valorisation of Cyrene Towards Fine Chemical Building Blocks

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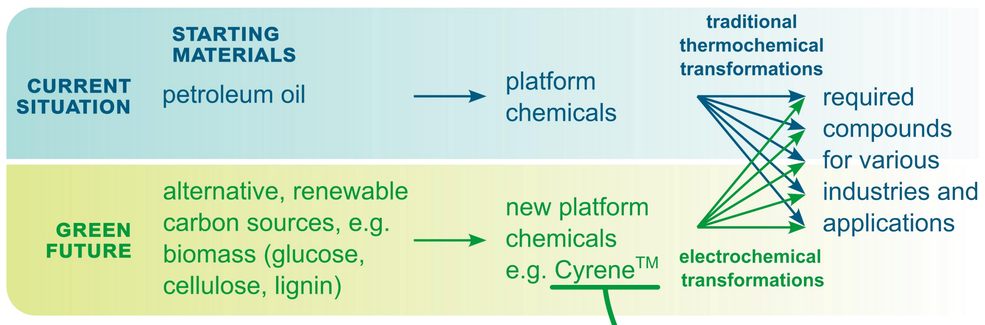
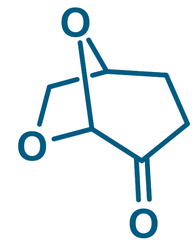
Chemical Industry



Cyrene™



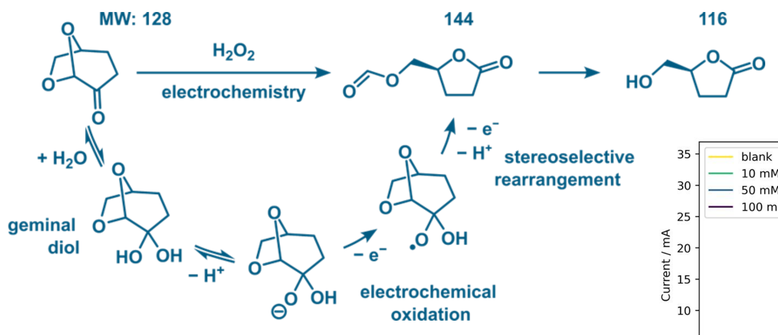
- non-toxic and biodegradable
- miscible with water in any ratio

- derived from cellulose waste
- industrially scalable production established

- promoted utilization: green solvent as substitute for toxic protic solvents, like DMF or NMP

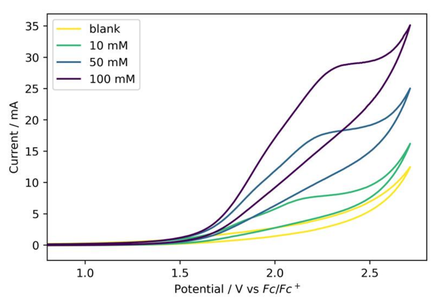
- bio-privileged molecule → potential as platform chemical

Baeyer-Villiger Oxidation

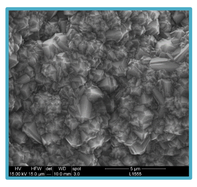


Boron-doped Diamond

- extremely large potential window
- preparation: HT-CVD from methane and trimethyl borane
- parameter: boron doping, crystal size, sp^2 ratio, support material
- chemically inert
- low adsorption

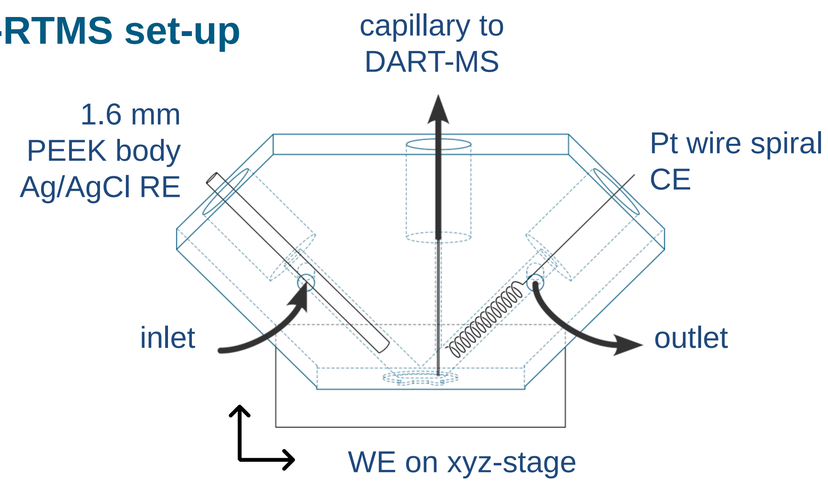


v = 150 mV/s, last cycle of 10 depicted, electrolyte: 0.1 M $LiClO_4$ in $MeCN/H_2O$ = 1/1, 0 – 100 mM cyrene, WE: BDD on Si, A = 1cm², CE: Pt on Ti, RE: Ag/AgCl

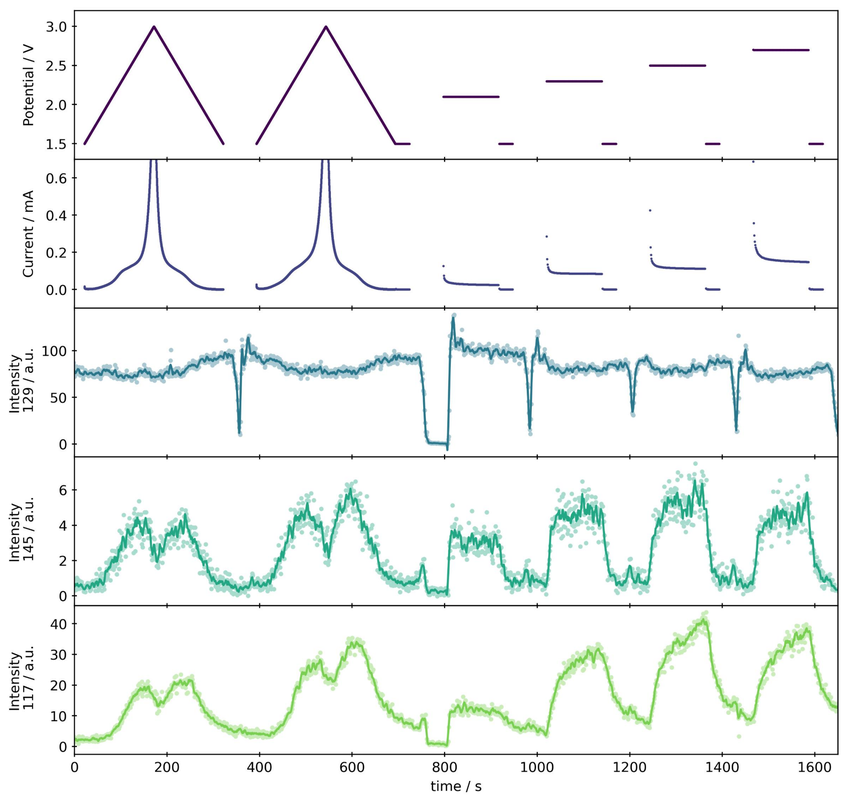


synthesized by WTM at FAU

SFC-RTMS set-up



Voltmassogram

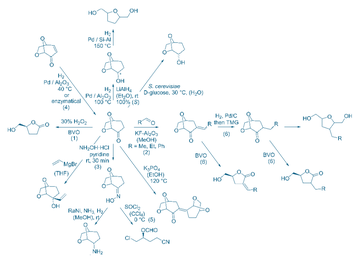


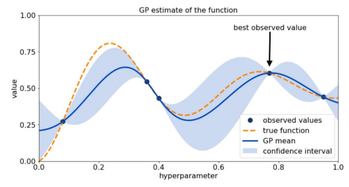
Conclusion and Outlook

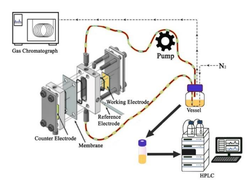
- Cyrene™ **can** be oxidized by electrochemical means
- chiral lactone as platform chemical for further applications
  → derivatization of the starting material by aldol condensation to screen scope of electrochemical BVO
  → investigate other possible reactivities

- SFC-RTMS set-up enables high-throughput screening
  → parameter and material optimization via Design of Experiments or Bayesian Optimization

- insights from SFC-RTMS only semi-quantitative
  → transfer to larger scale flow cell
  → parallelization and automation to increase reproducibility and accelerate research
  → quantification of conversion, space-time yield, and Faradaic efficiency by coupling to HPLC







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