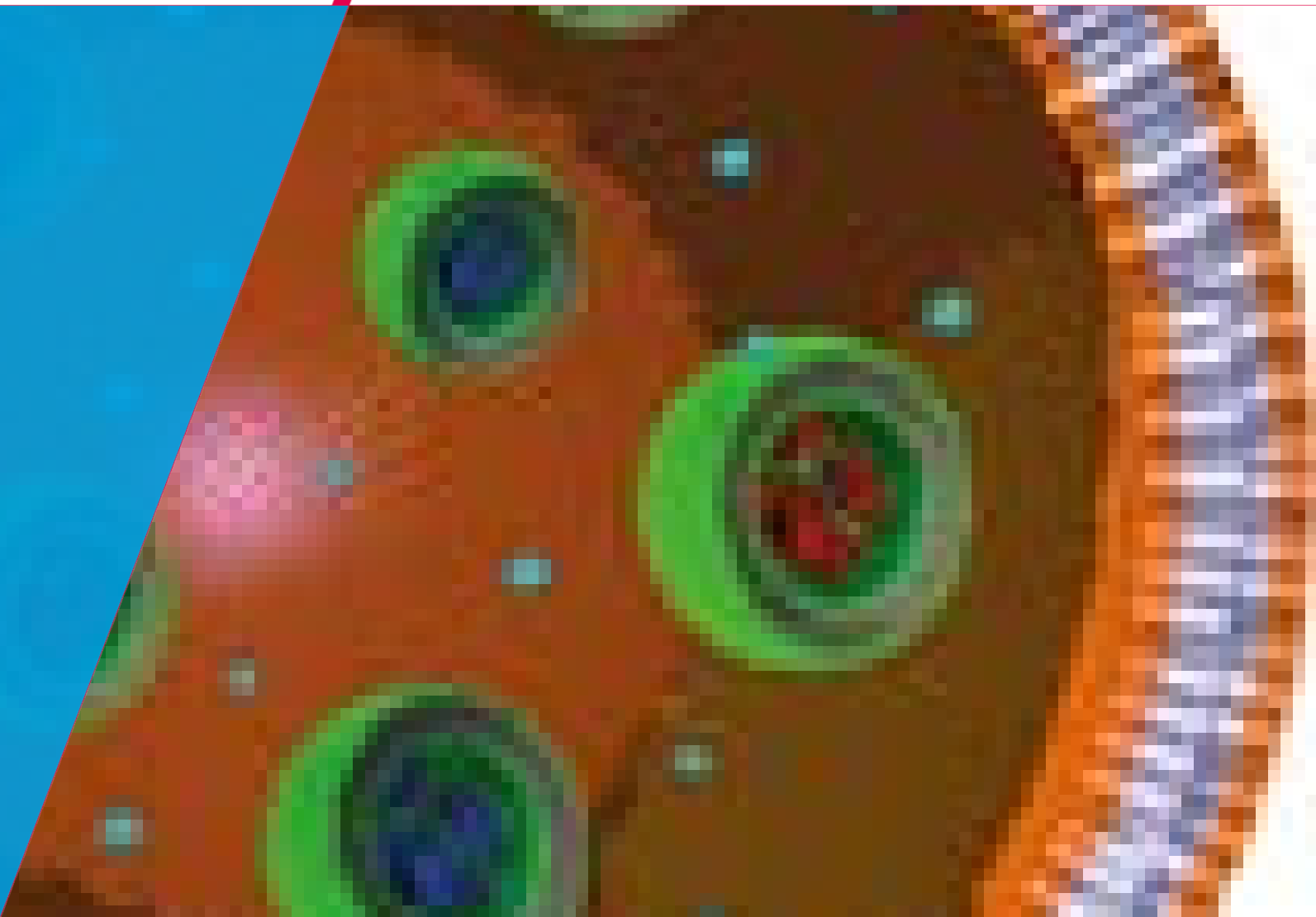
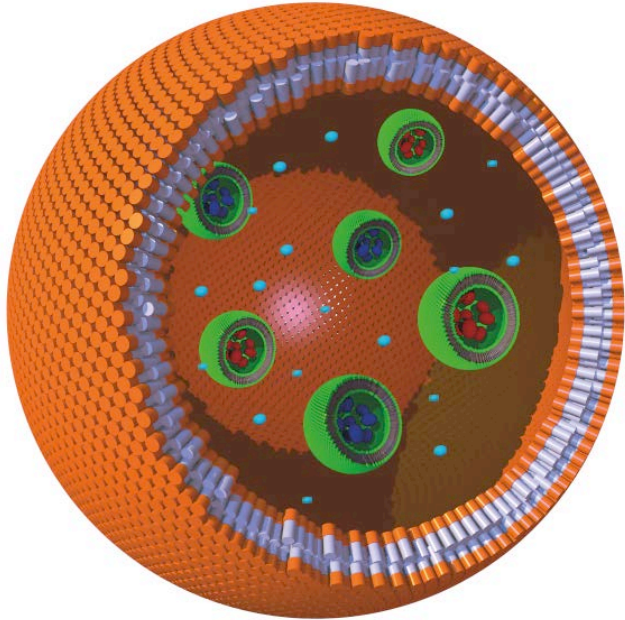


FET-open TU2 (Bio-organic Chemistry)

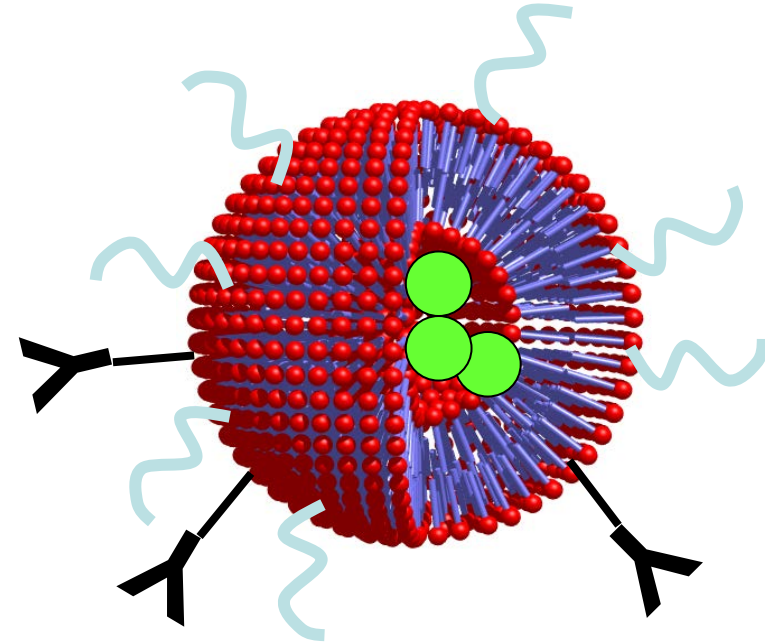
Jan van Hest
January 18th 2017



Molecular life-like systems: smart compartments



**Artificial cells, organelles
and nanoreactors**



Nanomedicine

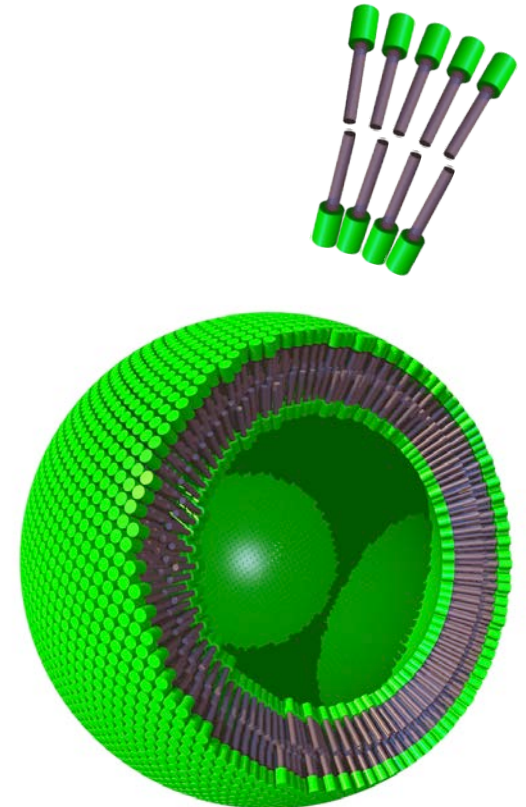
Polymersomes as nanoreactors

Robust and versatile system

Catalysts can be encapsulated
with positional control in the lumen or bilayer

Permeability in aqueous environment

Stabilization when in contact with organic solvents



Specific Objectives (1)

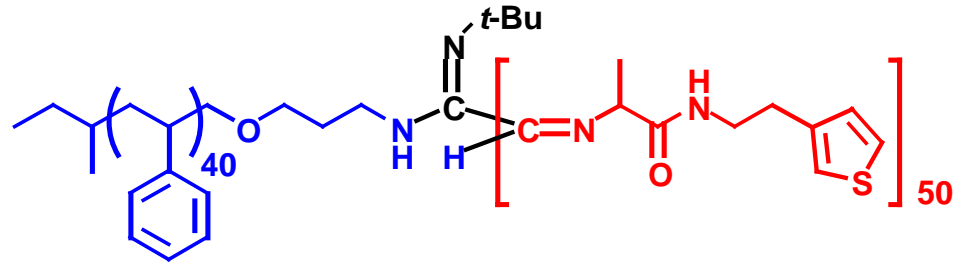
- Polymersomes to harmonize catalyst and solvent in a biphasic reaction system
- More catalysts (>2) will be placed in a polymersome
- Polymersomes eliminate the need for usage of different solvents: enzymes and chemocatalysts work together in the presence of water.

Specific Objectives (2)

- Develop analogues of Δ^9 -tetrahydrocanna-binol (THC)
- Replace purely enzymatic (prenyltransferase, synthetase) process by a mixed chemobio catalysis.
- Create a generic tool to extend to multiple catalytic steps
- Integration in continuous flow system

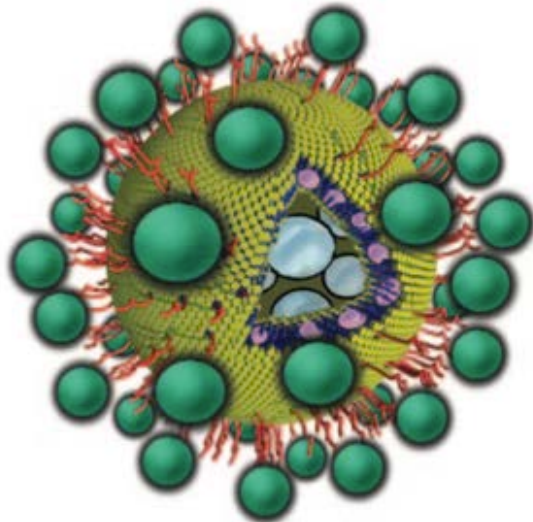
Intrinsically porous nanoreactors

PS-PIAT nanoreactors: semi-porous structure, which allows diffusion of small molecules.

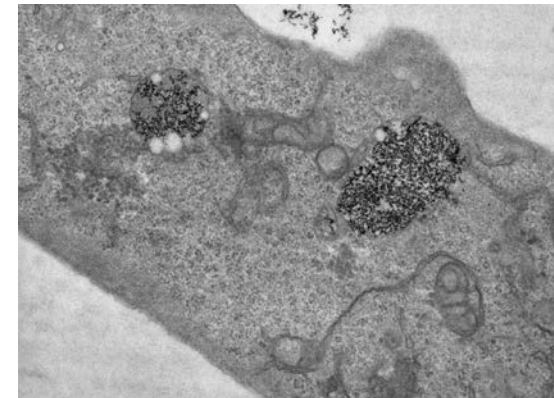
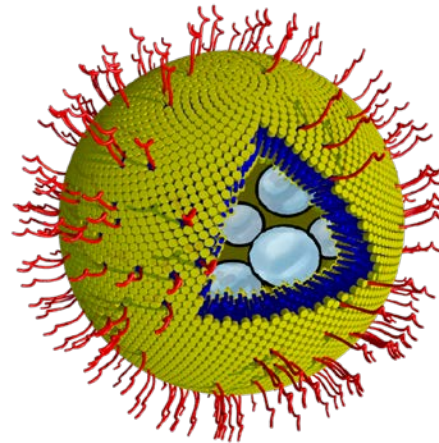


Polystyrene-polyisocyanate-L-alanyl-amino-ethyl-thiophene (PS-PIAT)

Positional assembly of multiple enzymes



Artificial organelles



Polymersome nanoreactors facilitating enzymatic biphasic reactions

Polymersome Pickering emulsion

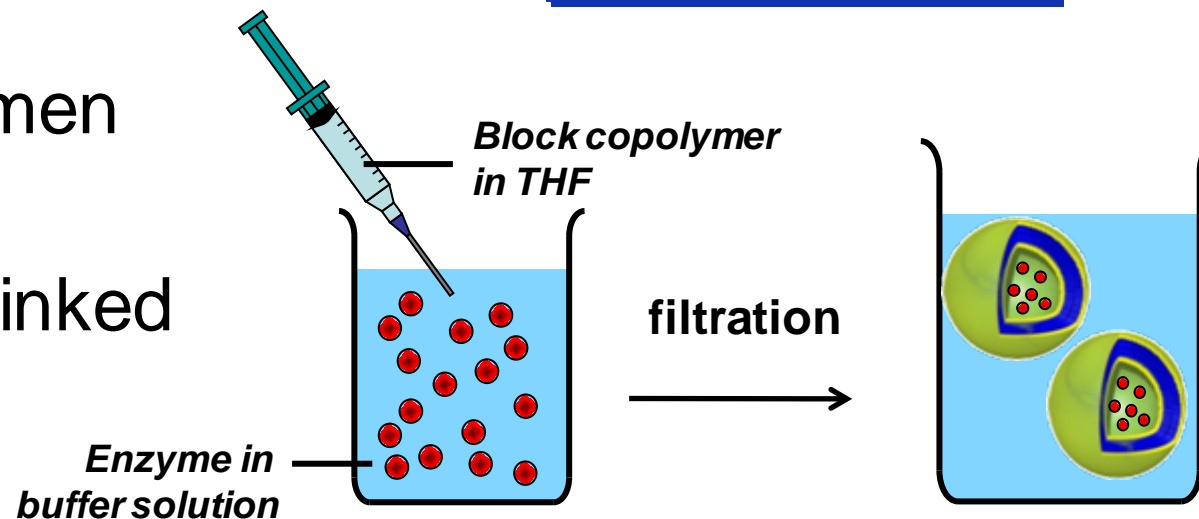
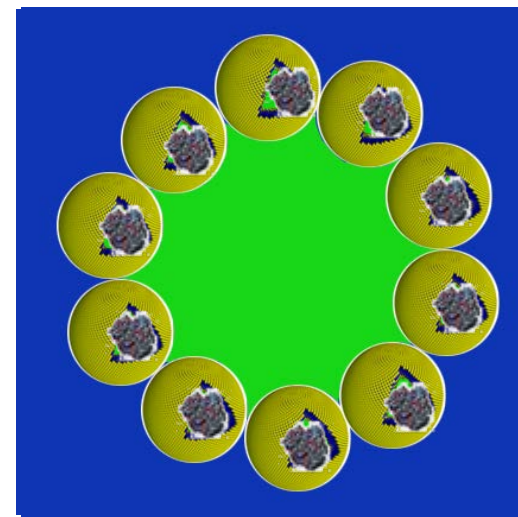
Large contact area

Enzyme protection

Enzymes in the water phase

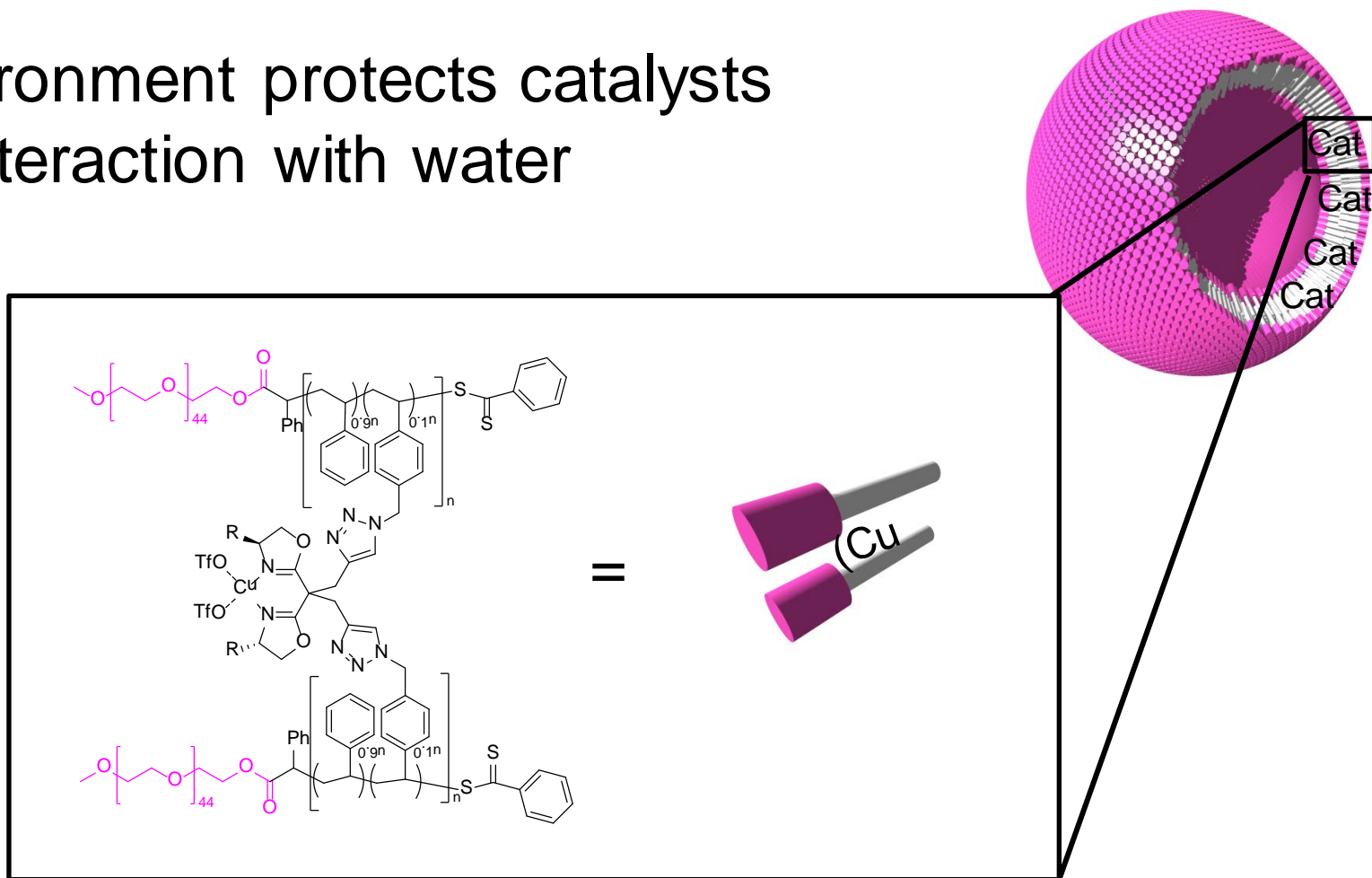
Enzymes in the polymersome lumen

Polymersomes need to be crosslinked

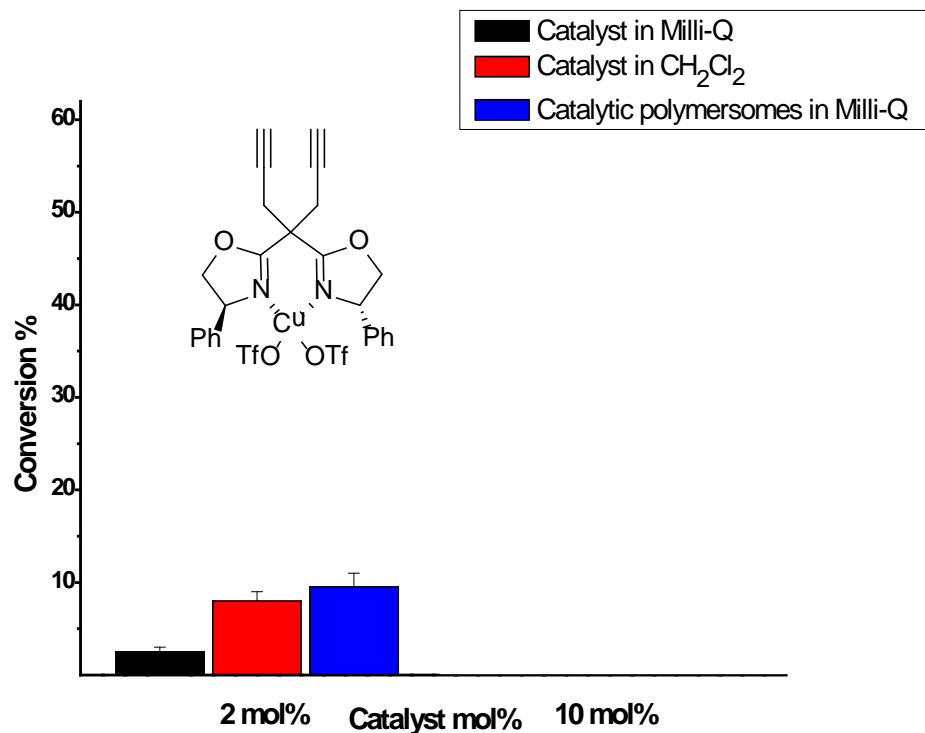
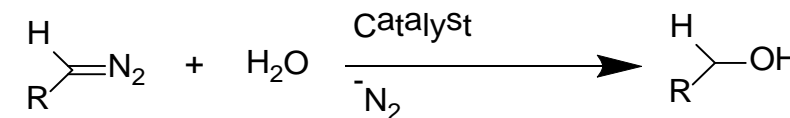
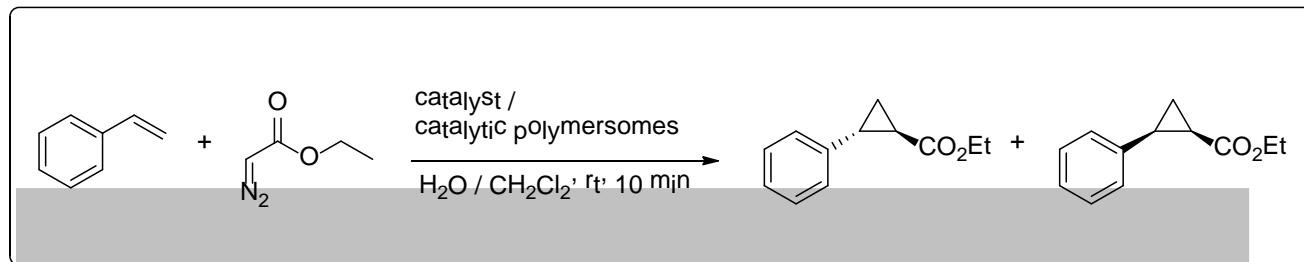


Catalyst immobilization in the polymersome bilayer

Hydrophobic environment protects catalysts from undesired interaction with water

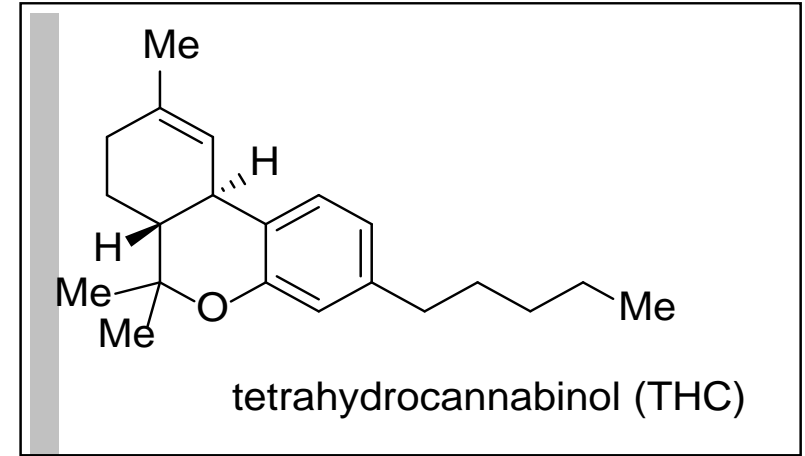
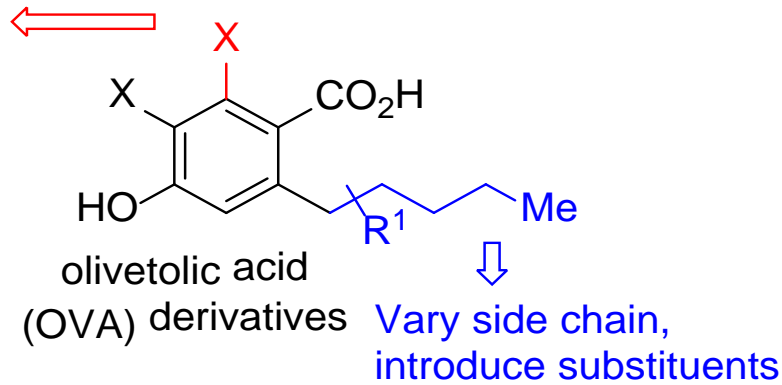


Aqueous asymmetric cyclopropanation



Cascade Painkiller cannabinoids

Modify OH function, introduce substituents



Introduce substituents

