

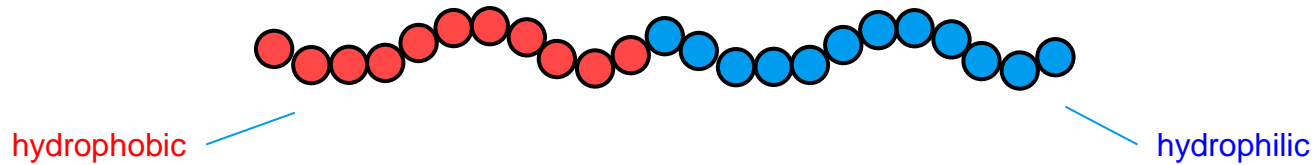


Research projects for MSc

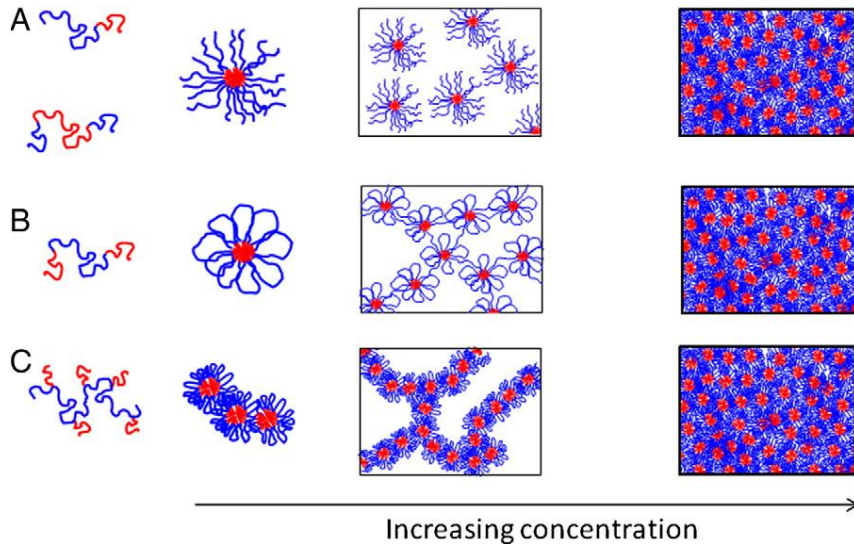
Dr. Patrizio Raffa
Assistant Professor
Polymeric Products



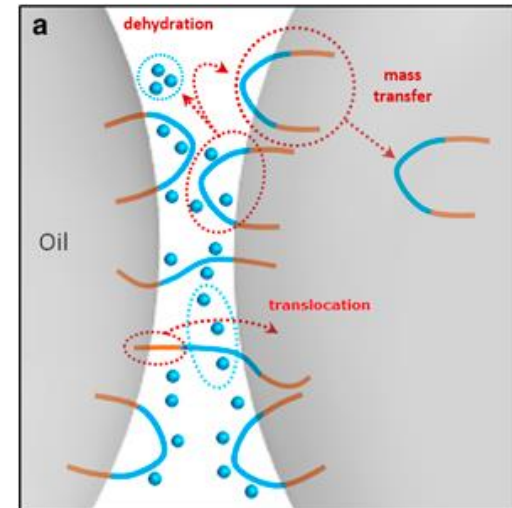
Polymeric Surfactants



Rheology (viscosity) control



IFT decrease and Emulsion stability





Applications



detergents



toothpaste



paints

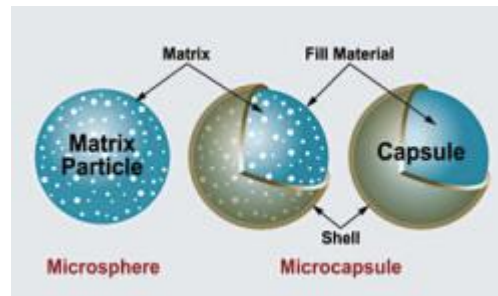


Crop protection agents

Hair gel



Protective coatings



Micro- nano-encapsulation gels

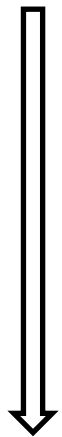


Pharmaceutical emulsions



One special application

Oil recovery



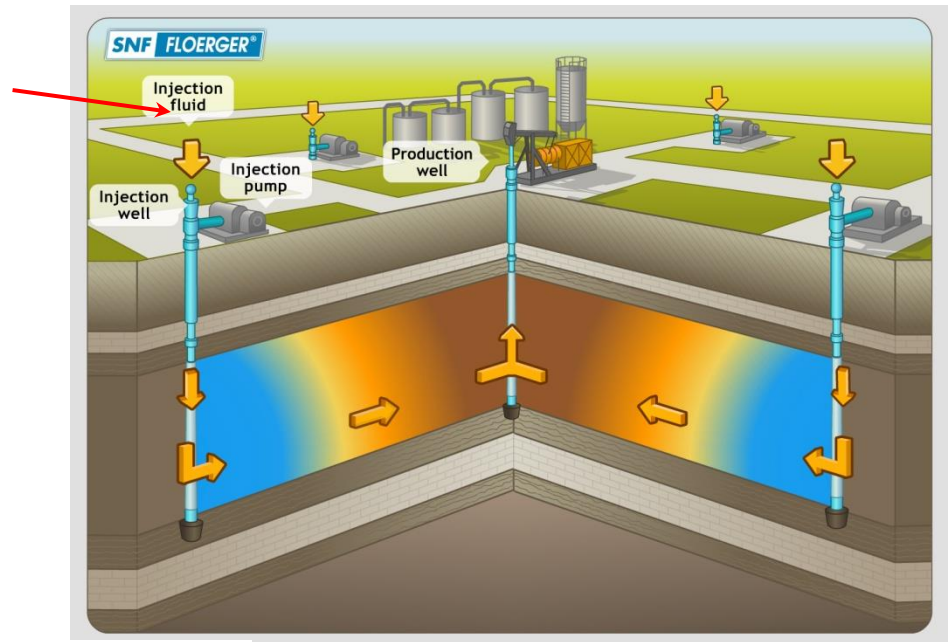
Primary

Secondary

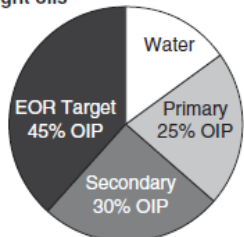
EOR

Steam injection
 CO₂ injection
 Polymer flooding
 surfactant flooding

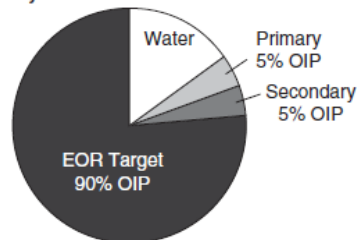
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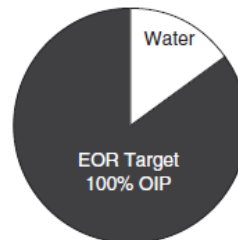
Light oils



Heavy oils

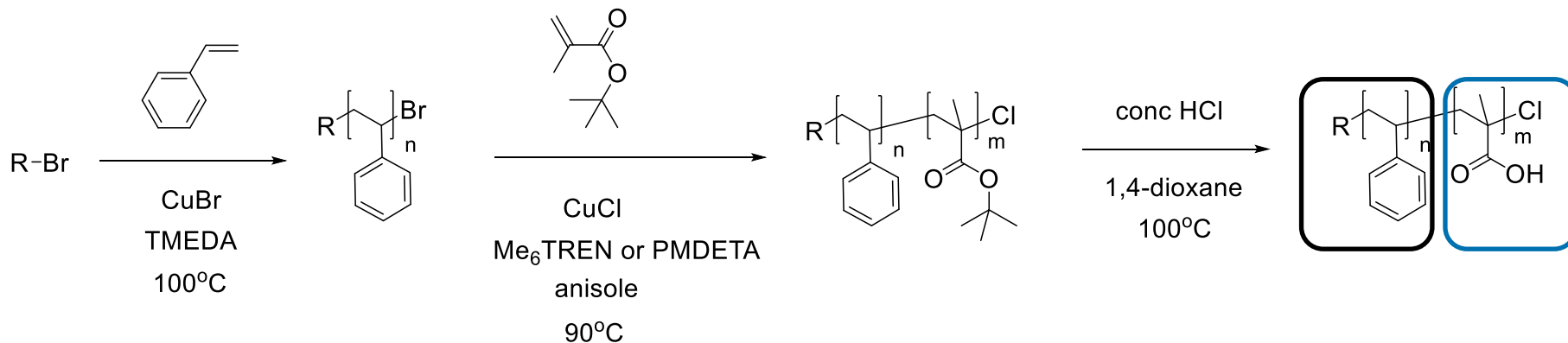


Tar sands



> 45% is still underground

Research on polymeric surfactants (1)



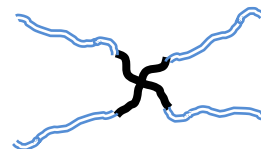
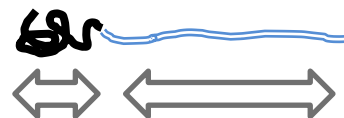
Structure-properties relationships
(more fundamental research)

Synthesis



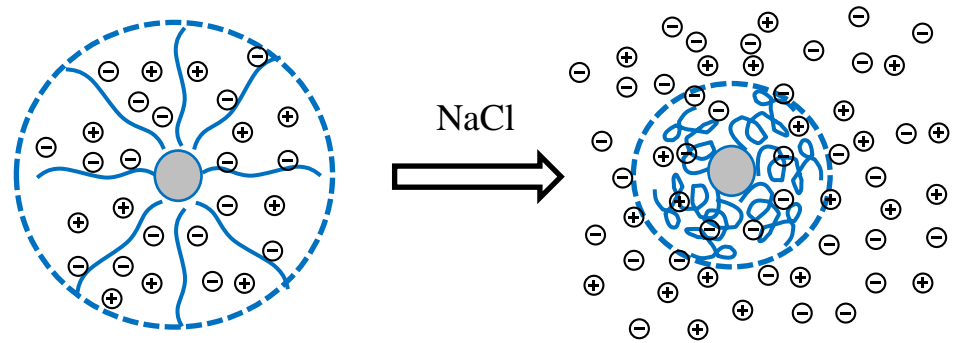
Rheology

Surface activity

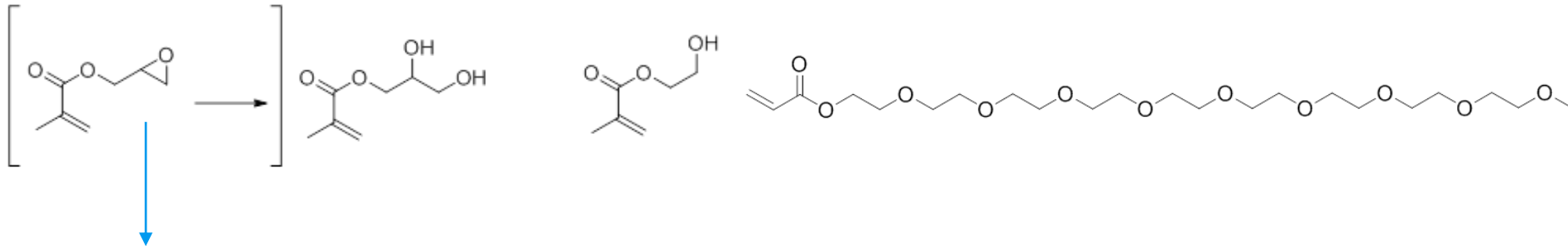


Research on polymeric surfactants (2)

Reduce salt-sensitivity
(for EOR or other applications)



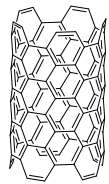
Use of neutral hydrophilic partners



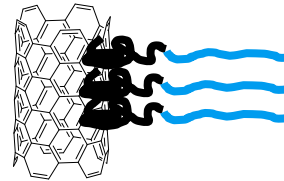
can be used for cross-linking / functionalization (e.g pyrene = fluorescent)



Research on polymeric surfactants (3)



+



pH- salt-responsive

Water dispersion of CNT



coating

pH



Conductivity



Partly bio-based polymeric surfactants

Introducing bio-based monomers
(for more sustainable/green products)

Waste from food industry



Sugar molecules



*Chemical
 modification*

Hydrophilic
 monomer



(co)polymerization

Polymeric
 surfactants

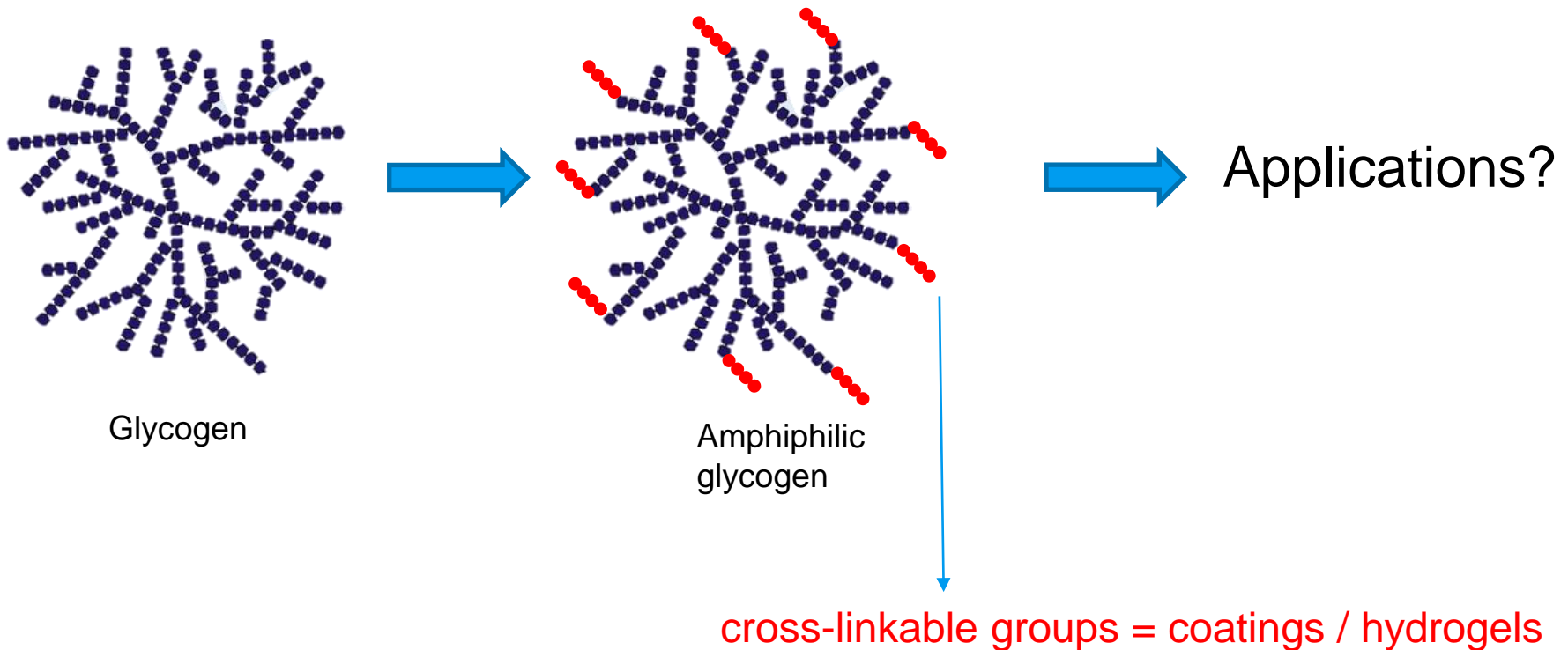
Industrial partners:



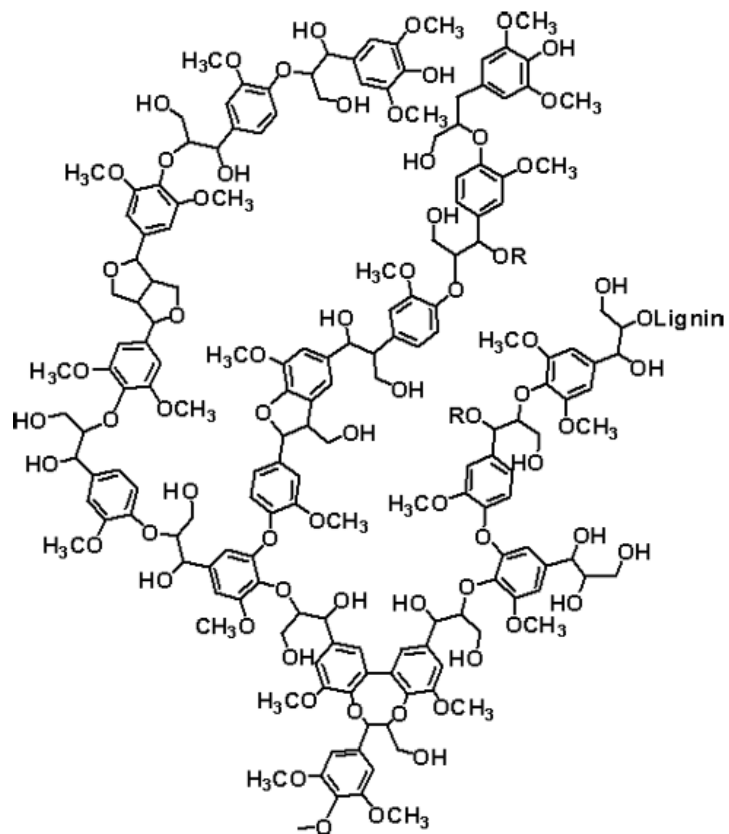


Partly bio-based polymeric surfactants (2)

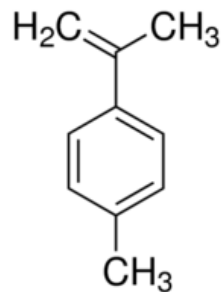
from nanoglycogen (Marc van der Maarel) or other polysaccharides



partly bio-based polymeric surfactants



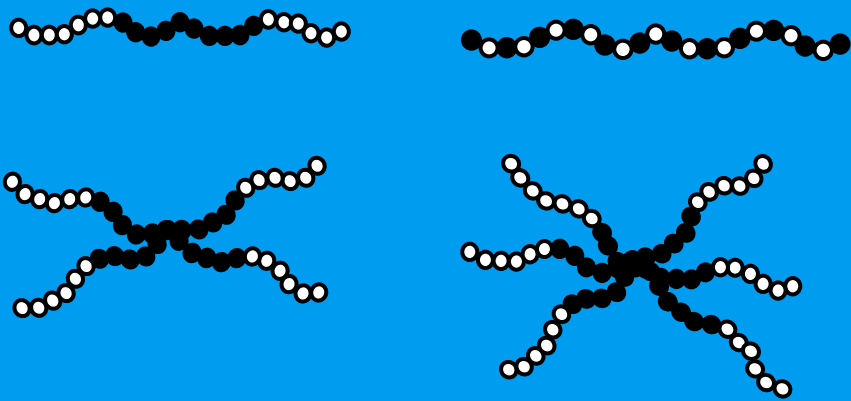
from ligning
(extraction with fatty alcohols?)



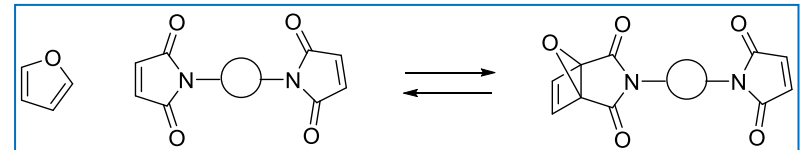
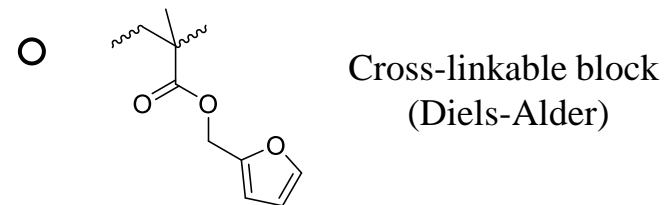
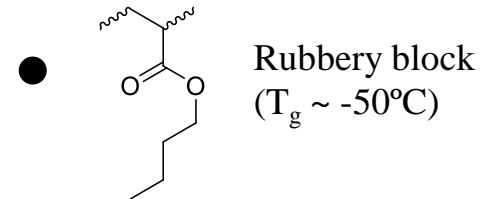
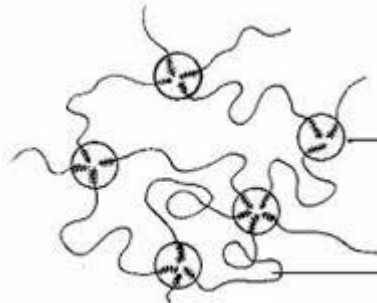
replacement of styrene
(can be made from limonene)

Research on self-healing materials

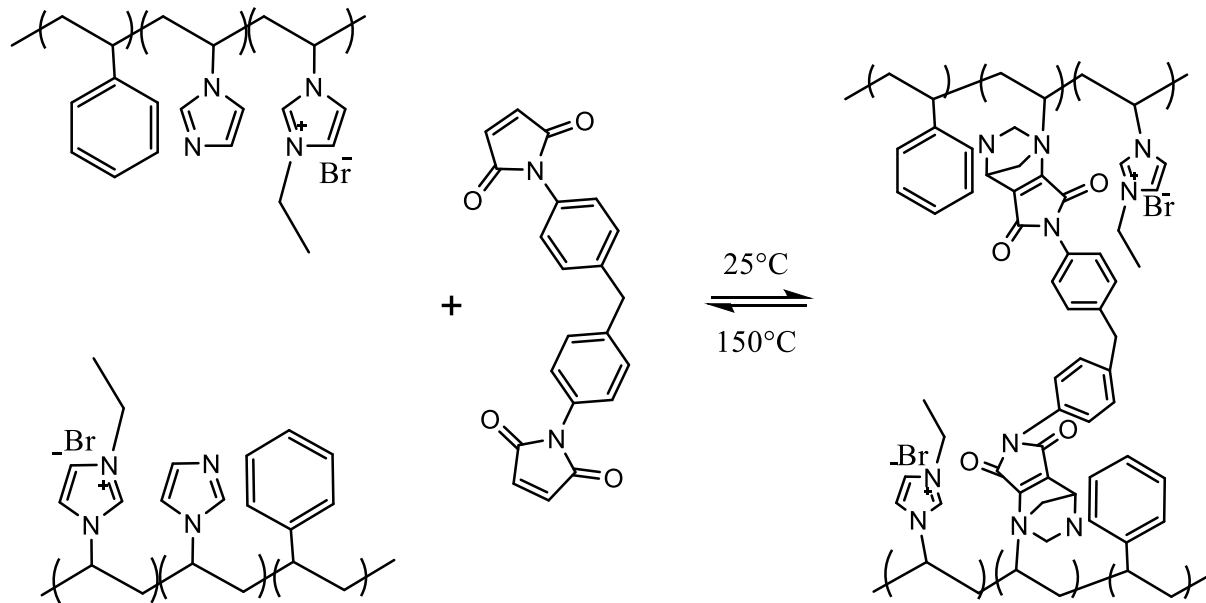
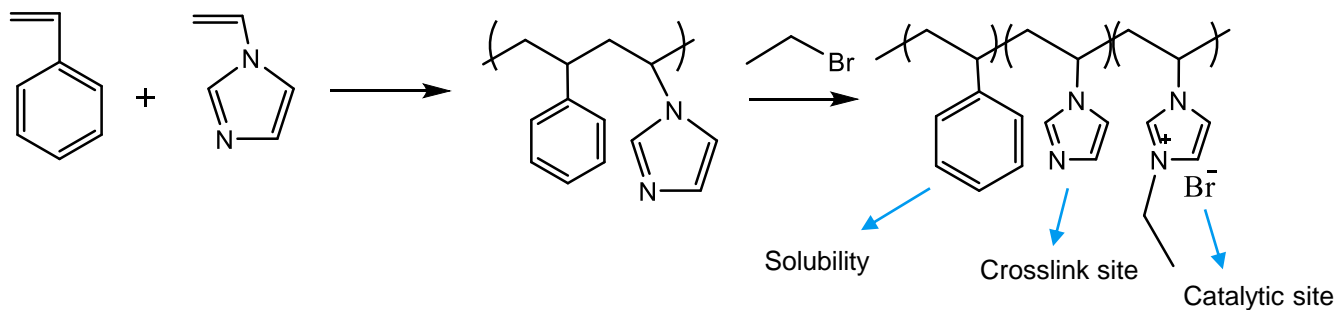
Controlled synthesis



Rubber
(SBS-like)

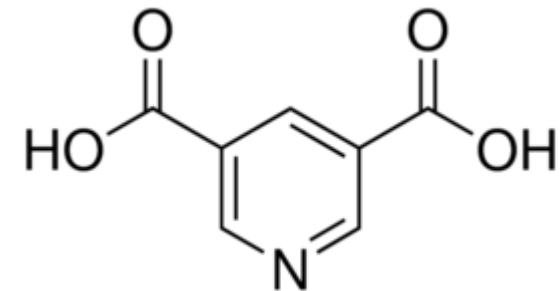


Catalysis with "smart" polymers





Cationic polyester emulsions for wood coating applications



Research problem: *Wood knots are visible as dark spots on light paint and light spots on dark paint. Knot bleeding is the phenomenon that the knots turn yellow because of the migration of anionic resinous agents, present in all wood types, to the paint surface. The knot bleeding can possibly be prevented by cationic primers, trapping the usually anionic resins and preventing these to reach the paint surface.*

Keywords: *Cationically charged polyesters containing quaternized 2,5-pyridine dicarboxylic acid will be synthesized by step-growth polymerization. These will be molecularly characterized and dispersed in water. The particle size distribution and the zètha-potential of the emulsions will be measured. Evaluation as 'non-knot bleeding wood primers' will be done in collaboration with DSM Coating Resins Zwolle.*

Supervisor Dr. Patrizio Raffa; Contact person from industry:

Prof. Cor Koning (1 day/week in group Prof. Picchioni); DSM Coating Resins, Zwolle; cor.koning@dsm.com



Contacts

- > p.raffa@rug.nl
- > 5118.0239

- > www.rug.nl/staff/p.raffa
- > www.chemenggroningen.com

