

# Teknisk kemi och reaktionsteknik /TKR/ÅA

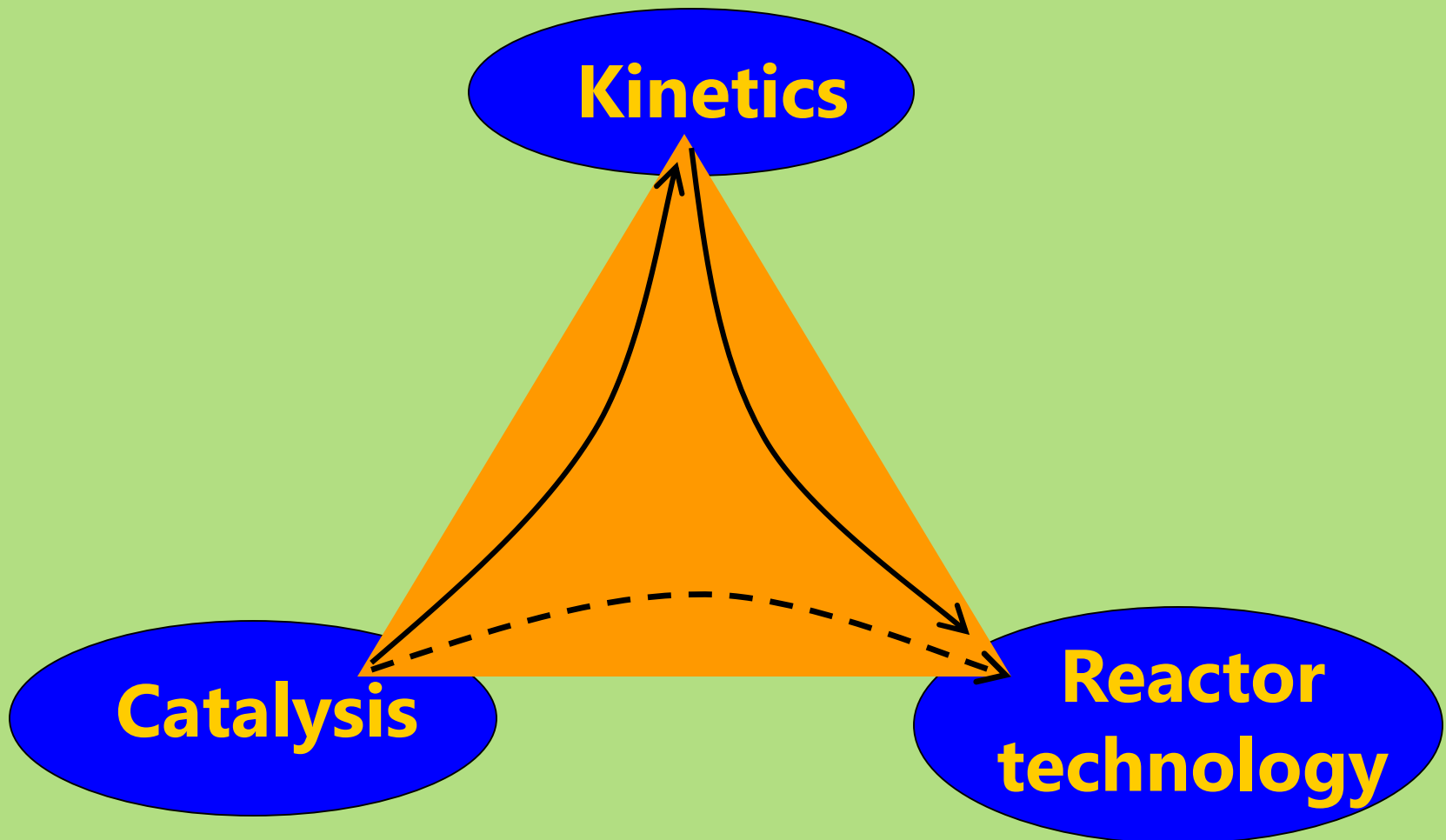
## Industrial chemistry and reaction engineering

100 years 1920-2020

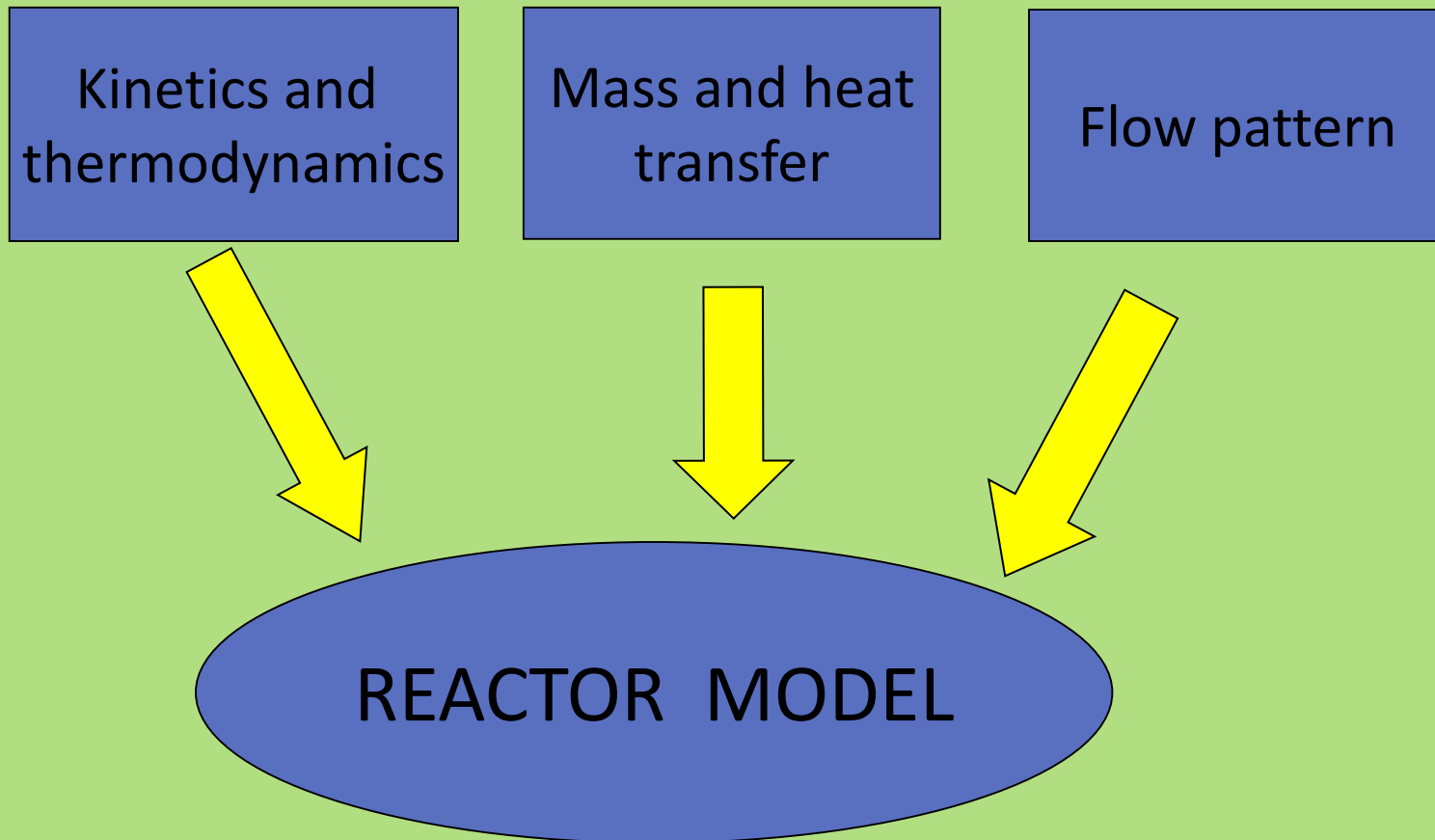
Date of Birth: 1.7.1920



# Activity profile

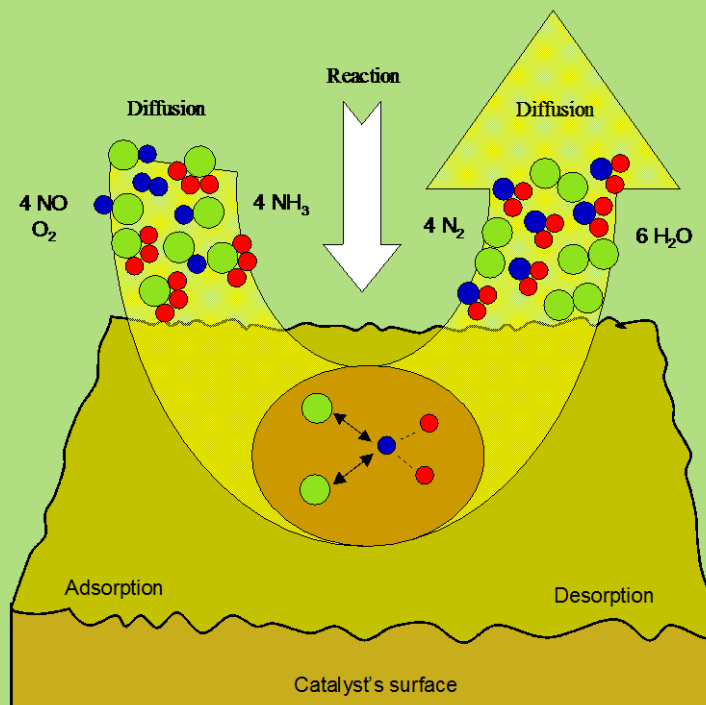


# Chemical reaction engineering



# Business idea

From reaction mechanism to reactor design  
From green chemistry to green process  
technology



# Examples of research projects

Development of new catalysts for the synthesis of chemicals and fuel components

Utilization of biomass for biofuels and fine chemicals

Direct synthesis of hydrogen peroxide

Epoxidation and carbonation reactions

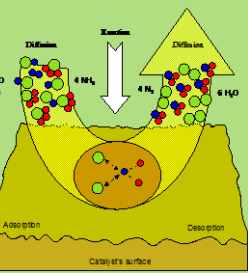
Catalytic oxidation and hydrogenation reactions

Micro and millireactor technology

Ultrasound and microwave technology

Ionic liquids in fractionation and chemical transformation

Techno-economic analysis and life cycle assessment



# Development of research infrastructure

New ultrafiltration device

New ATR and sorptometer in active use (**Foundation of ÅA and Academy of Finland** granted the money)

New and refurbished Micro-GCs in active use (**Foundation of ÅA** granted the money)

New microwave device arrived (from Sairem; **Foundation of ÅA** granted the money)

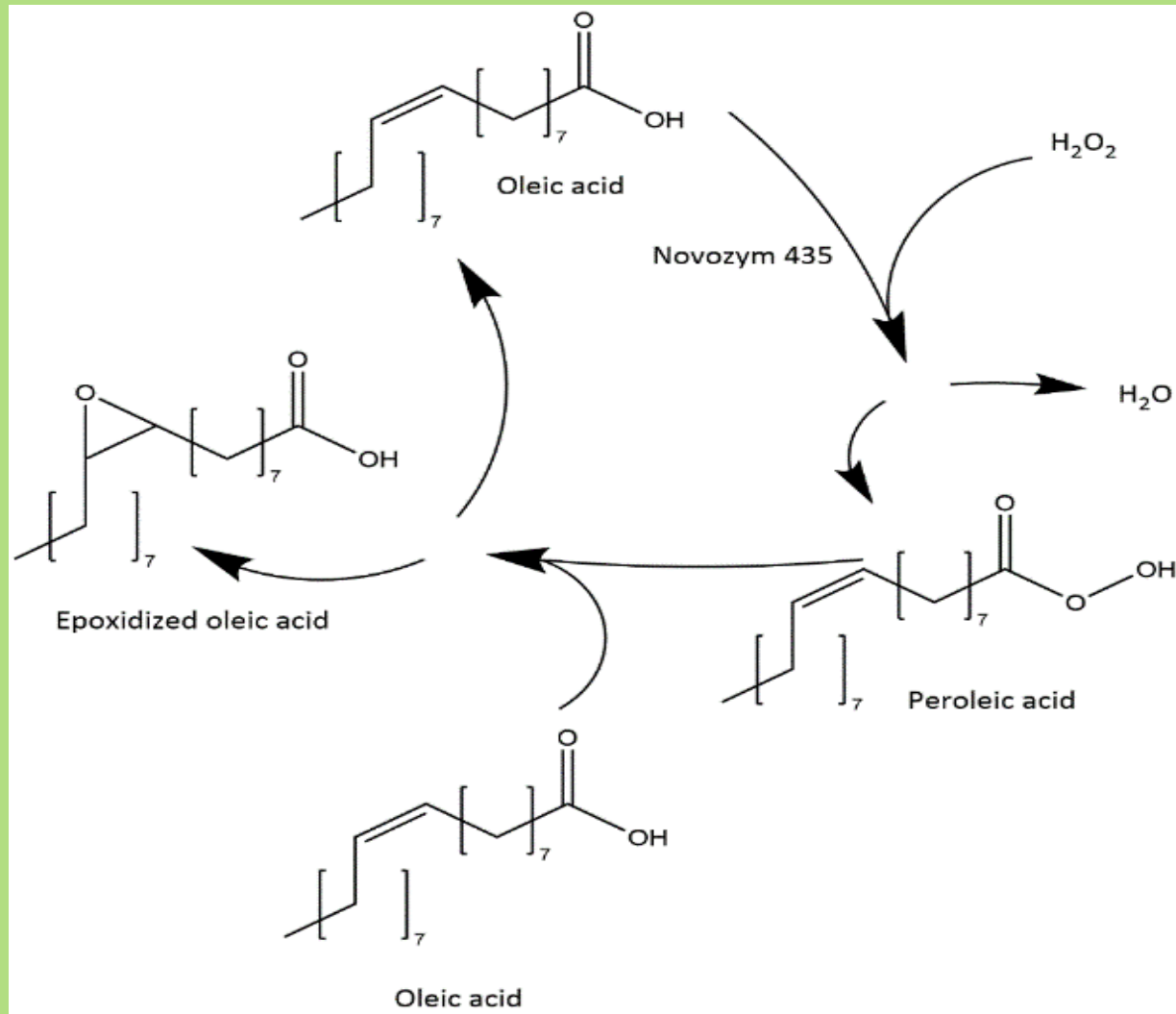
2D gas chromatograph arrived (**Business Finland** granted the money)

New Chemisorption-TPD-TPR device Belcat came to Aurum (ÅA granted the money)

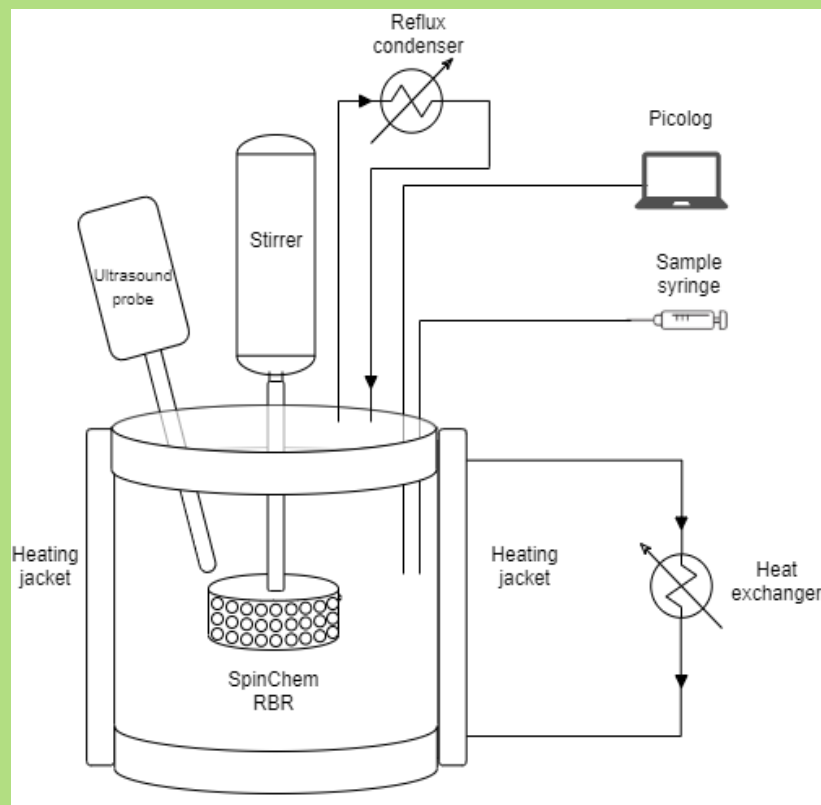
Thank you Kari et al for implementing all this!



# Direct enzymatic epoxidation of fatty acids



# Experiments in laboratory scale: spinning basket



Oleic acid as a model molecule

Catalyst: Immobilized *Candida*

*Antarctica* lipase B acrylic resin Novozym® 435

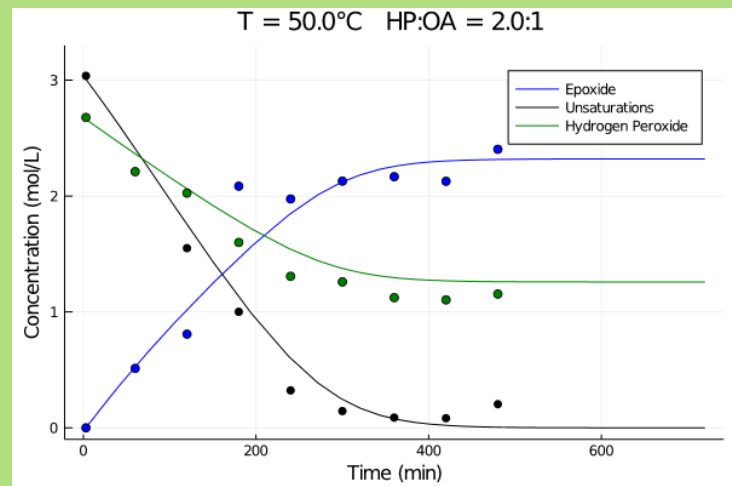
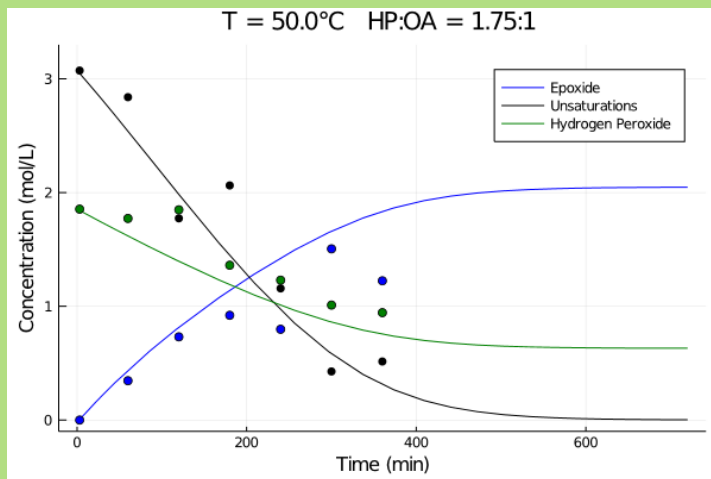
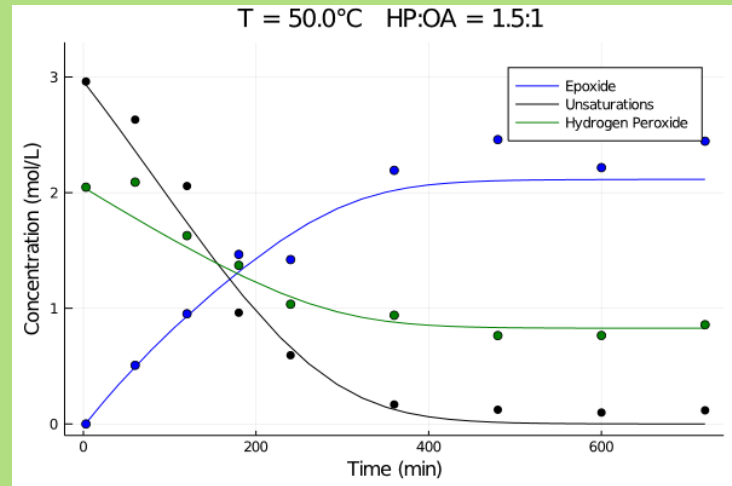
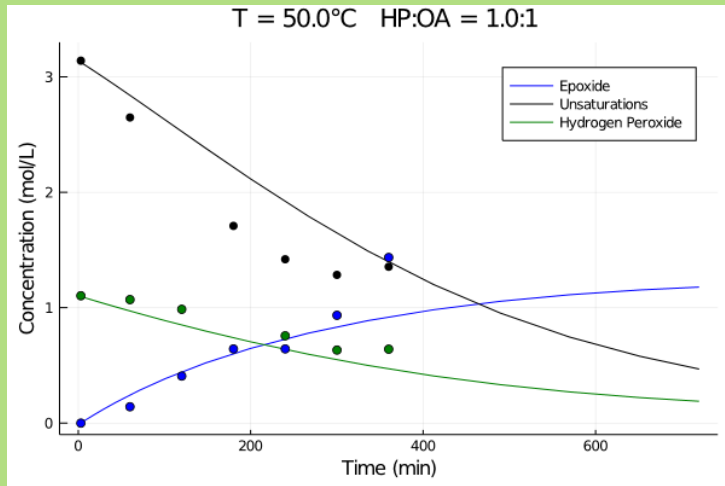
Chemical analysis: titrations, NMR

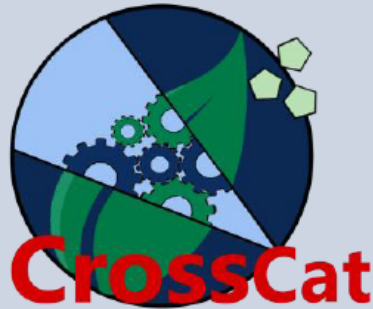
Physical analysis: SEM and nitrogen adsorption





# Data fitting results – the model explains!

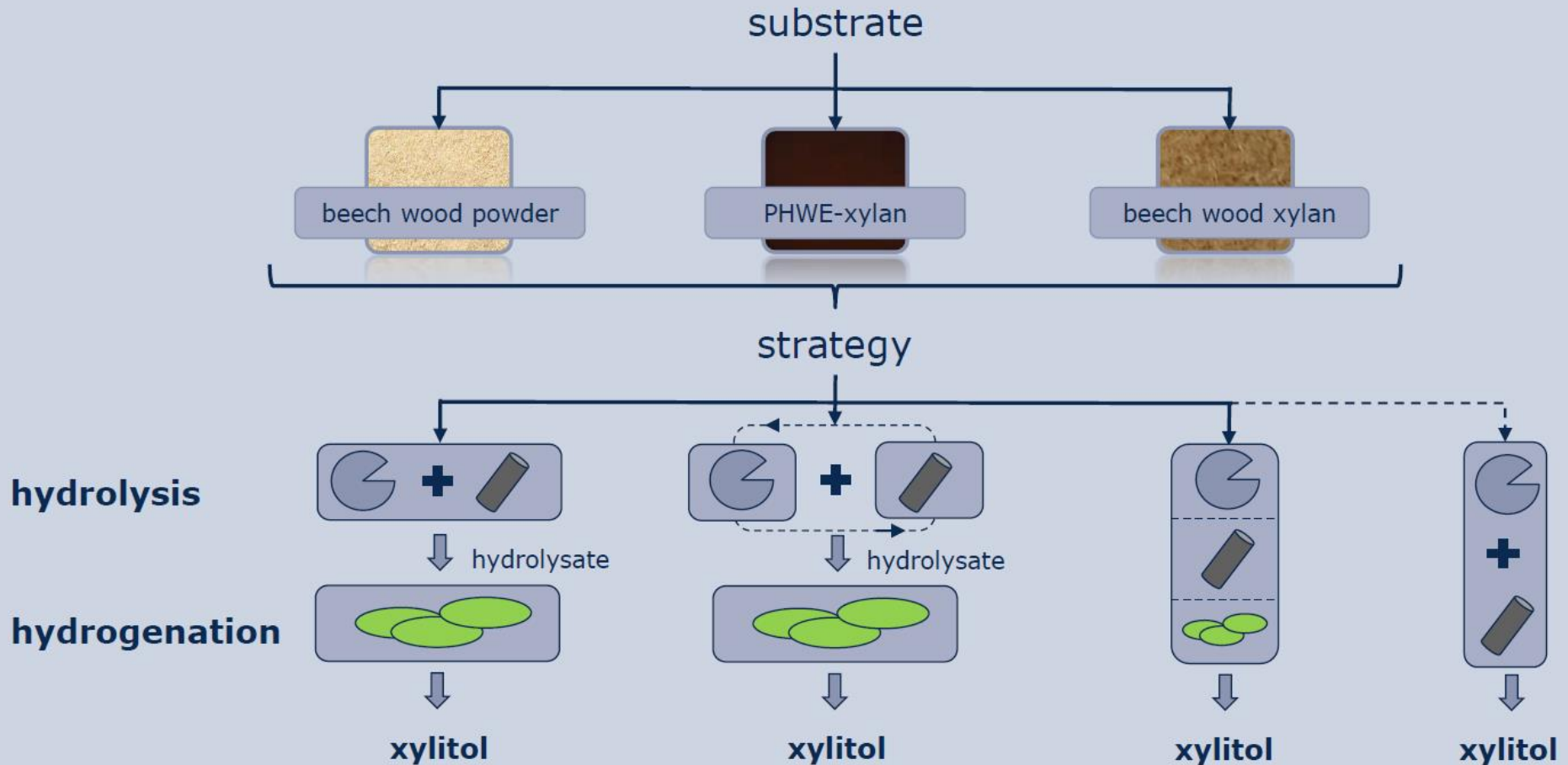




# Symbiosis of bio- & chemo-catalysts for the sustainable conversion of hemicelluloses

- Characterization and hydrolysis performance  
of immobilized enzymes -

# Combining chemo- and enzymatic catalysis





# TKR 2020 – 100 years of science and education – work and creativity

