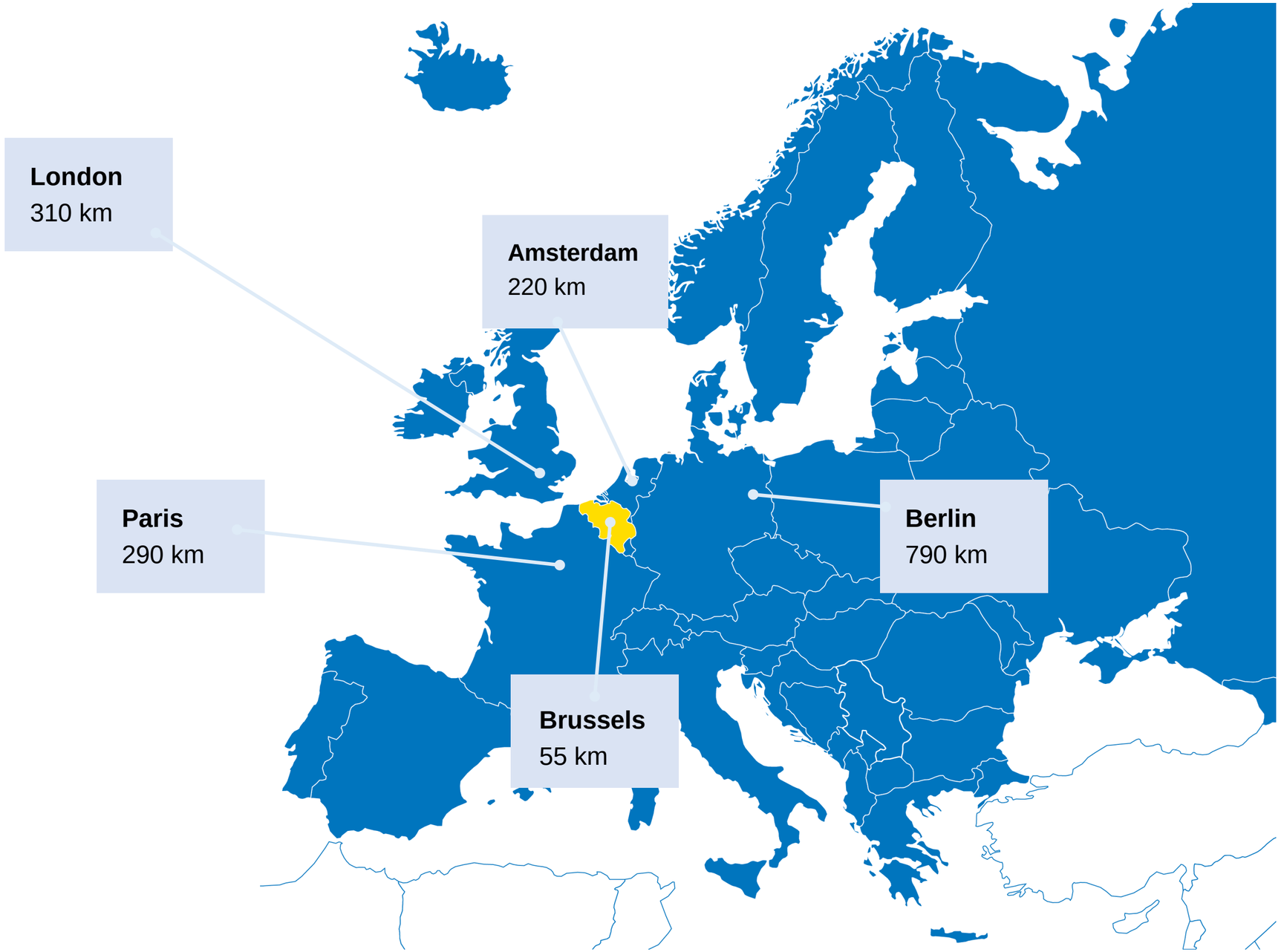
THIS IS GHENT UNIVERSITY

© UGent, Jonas Vandevasteele en Yentl Vandendriessche

GHENT UNIVERSITY

GHENT (BELGIUM)



GHENT UNIVERSITY

GHENT (BELGIUM)

A genuine student city with

+70,000 students

GHENT
UNIVERSITY

EDUCATION

Total number of students	45,979
International students	13%

(NUMBERS: OCT. 2019)

GHENT UNIVERSITY

RESEARCHERS AT GHENT UNIVERSITY

Total number of researchers	8,220

Professorial researchers	1,433
Postdoctoral researchers	1,462
Predoctoral researchers	5,325

(NUMBERS: OCT. 2019)

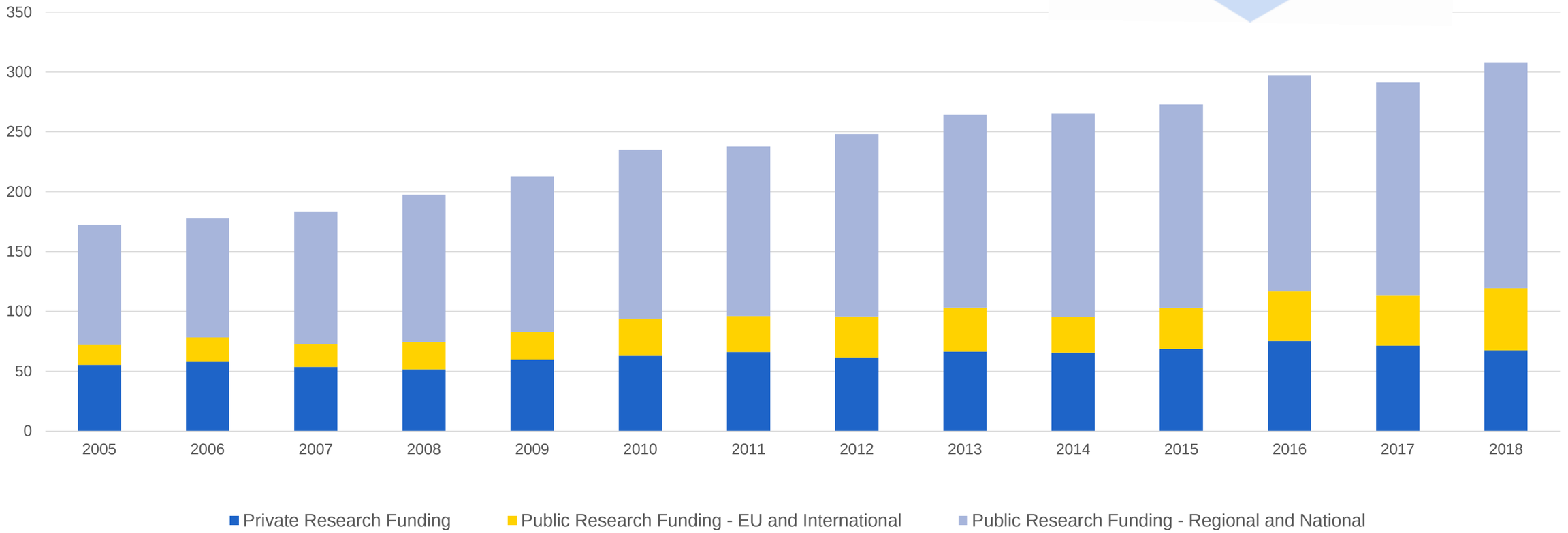
GHENT UNIVERSITY

HR EXCELLENCE IN RESEARCH

INPUT

Research expenditures 2018: € 308 million

66 ERC projects

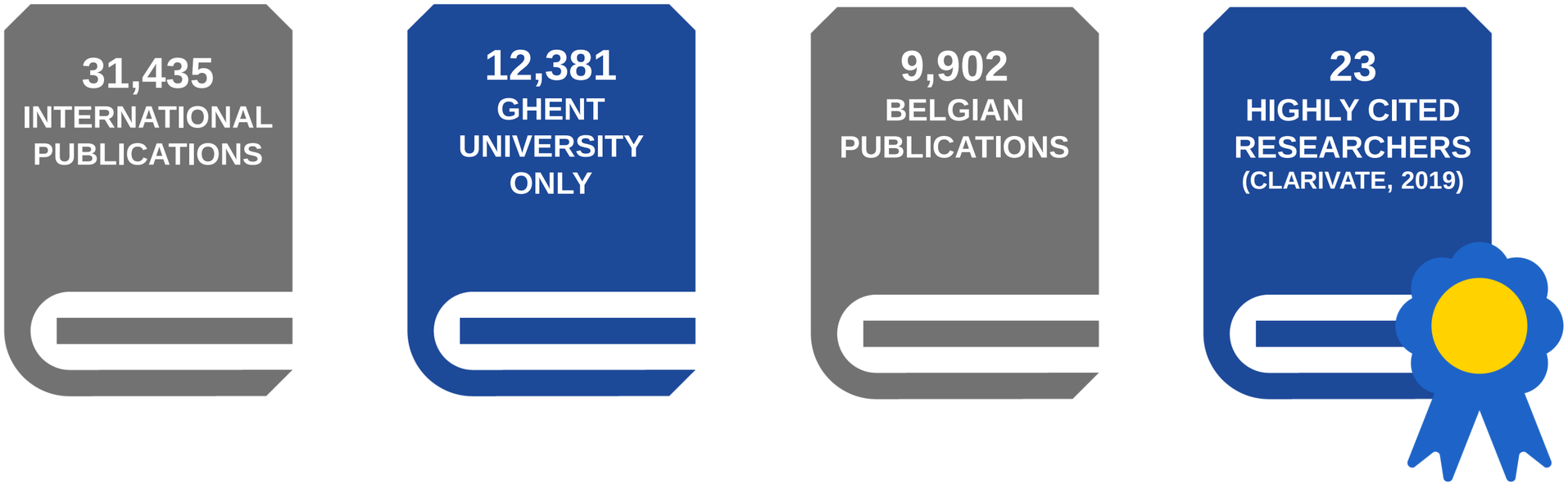


(NUMBERS: JUNE 2019)

GHENT UNIVERSITY

OUTPUT

Publications 2008 - 2018



Total number of publications at Ghent University	53,718

(PUBLICATIONS: SCIE, SSCI, AHCI IN WOS - NUMBERS: 2018)

GHENT UNIVERSITY

STUDENT MOBILITY

2,052 Ghent University students abroad yearly
[23% of all graduating students with experience abroad]

6,012 Foreign students at Ghent University
[including 1,542 exchange students and 393 at GUGC]

European pioneer in the digitisation of student mobility processes

erasmus without paper

GHENT UNIVERSITY

(NUMBERS: OCT. 2019)

RANKINGS

Academic Ranking of World Universities 2020 (Shanghai ranking)

Worldwide: 66

National: 1

Times Higher Education Ranking

Worldwide: 143

National: 3

(NUMBERS: 2020)

GHENT UNIVERSITY

LABORATORY FOR CHEMICAL TECHNOLOGY

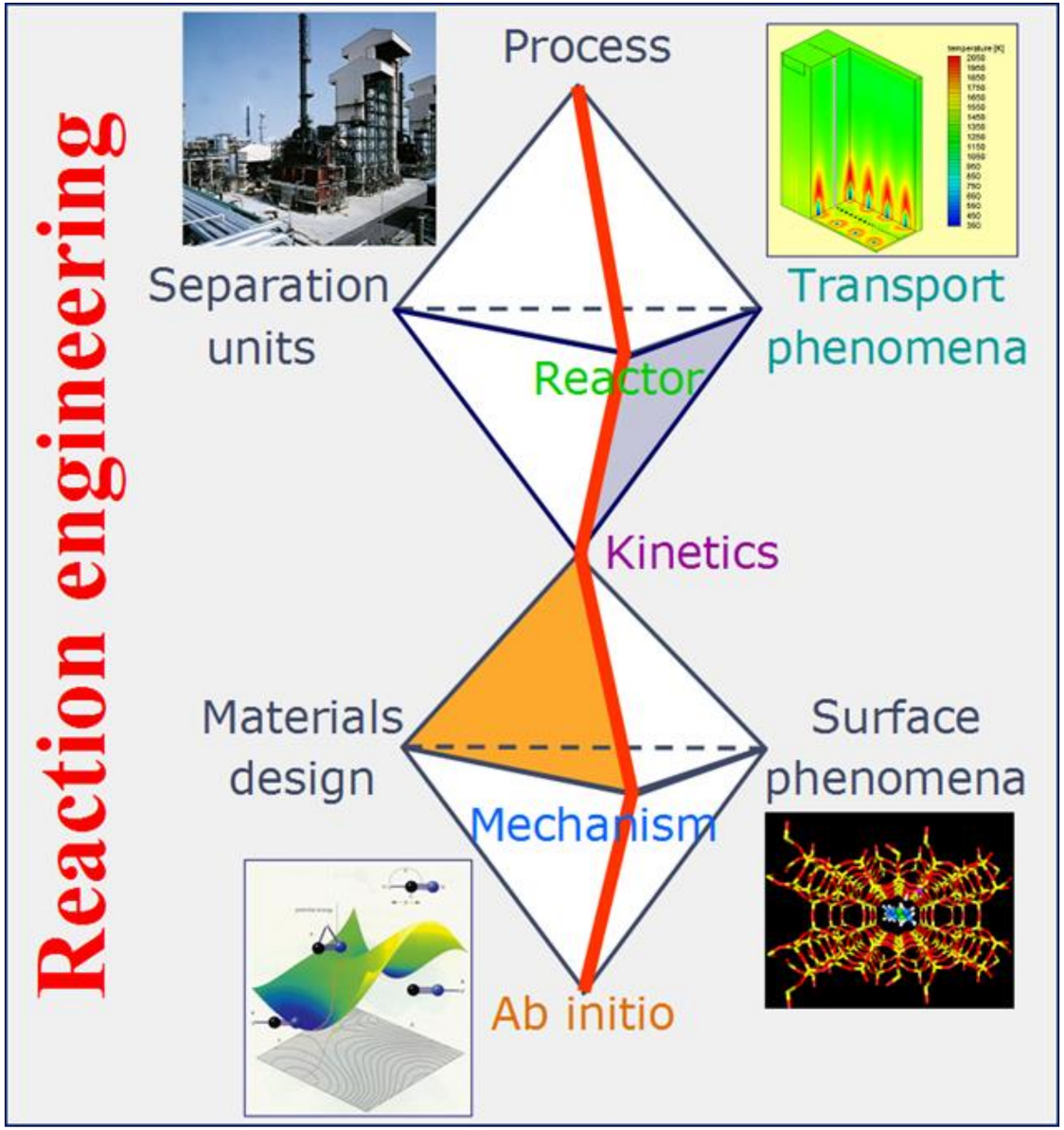
Executive committee: Mark Saeys, Joris W. Thybaut & Kevin M. Van Geem (chair)

Board: Geraldine J. Heynderickx, Marie-Françoise Reyniers, Mark Saeys, Joris W. Thybaut, Kevin M. Van Geem, Georgios Stefanidis, Dagmar R. D'hooge, Vladimir V. Galvita, Maarten K. Sabbe, Paul Van Steenberge

GHENT UNIVERSITY

LCT
DRIVING CHEMICAL TECHNOLOGY

From molecule to process

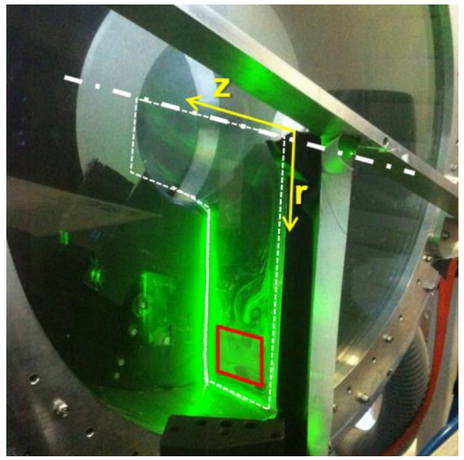


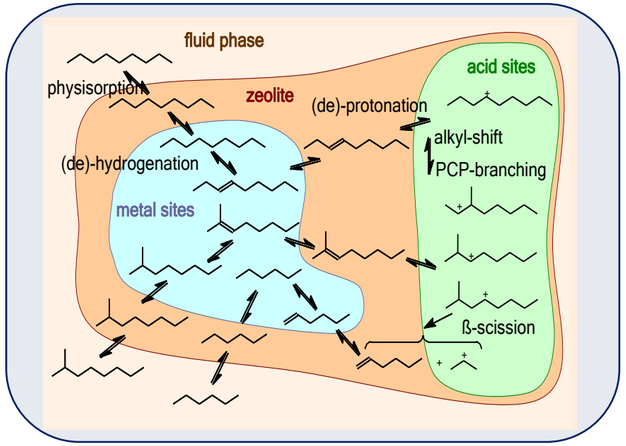
Permanent staff members (11)

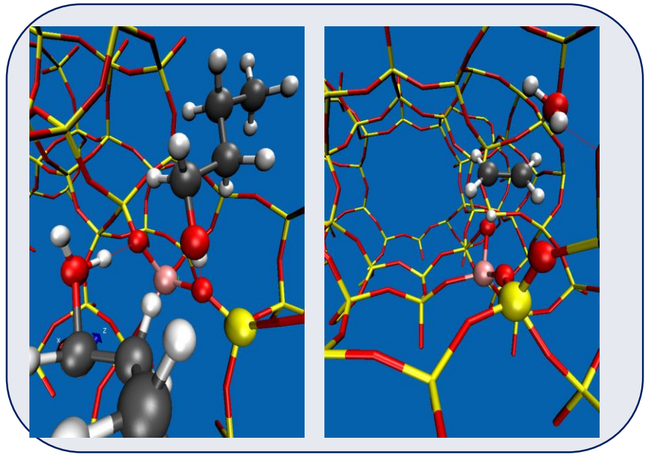
Prof. G.J. Heynderickx
Prof. G.B. Marin
Prof. M.F. Reyniers
Prof. M. Saeys
Prof. J.W. Thybaut
Prof. K.M. Van Geem
Prof. D.R. D'hooge
Prof. V.V. Galvita
Prof. M.K. Sabbe
Prof. Stefanidis
Prof. Vansteenberge

Guest lecturers or professor (4)
Senior and visiting scientists (4)
Postdocs (16)
PhD students (62)
Technical staff and administration (11)

From molecule to process







transport

heat and mass transfer

conservation laws

reactor model

chemistry

elementary reactions

quantum chemistry

experiment

reaction network

kinetics and thermo

microkinetic model

process

dimensions

heat duty

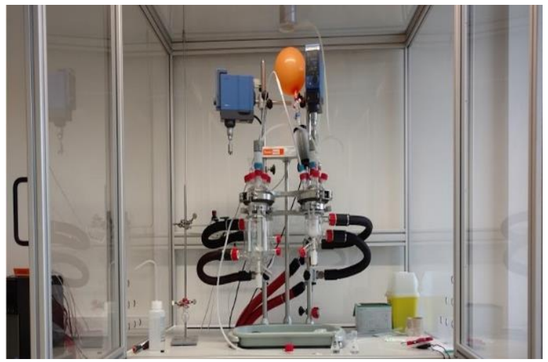
temp. field

conc. field

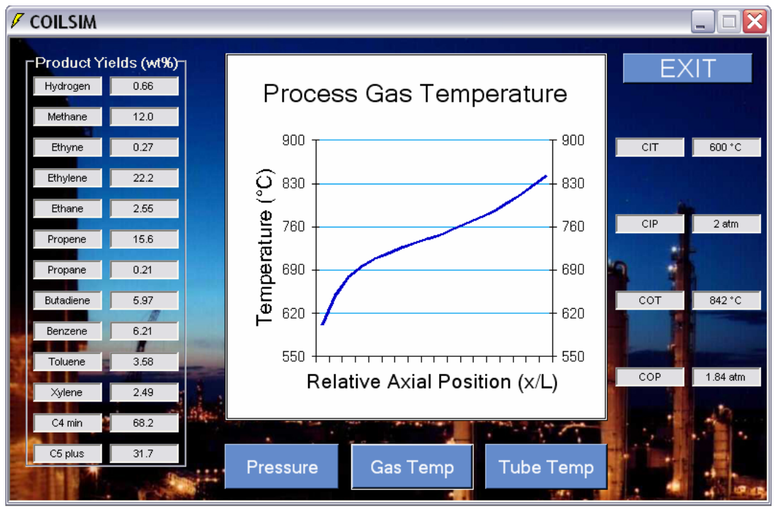
rates

yields

LCT infrastructure and assets

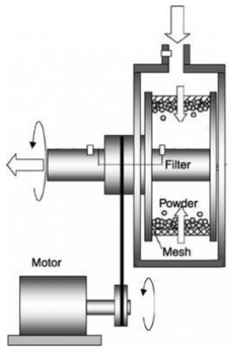


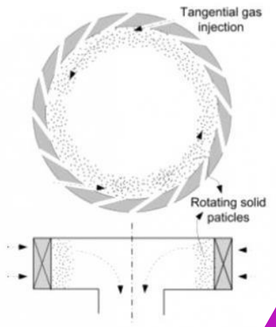
- Pilot plant Steam Cracker: 1
- Cold flow set-ups: 3
- Lab-scale set-ups: >10
- High-throughput kinetics reactor: 2
- TAP: 1
- Emulsion polymerization set-up: 1
- GCxGC (on line): 5
- Computing resources: 3 64-bit HPCCs (> 500 processor cores)

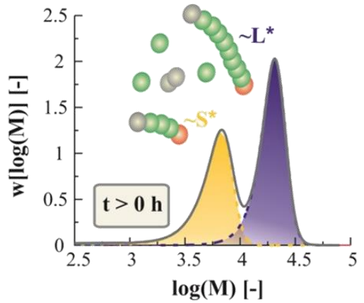


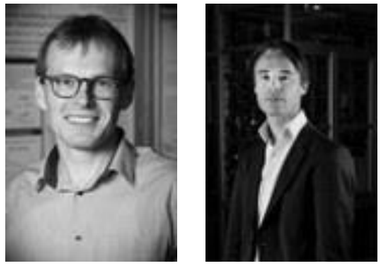
Commercialization of software packages for model-based production analysis and design

Communication along reseach themes









Polymer design

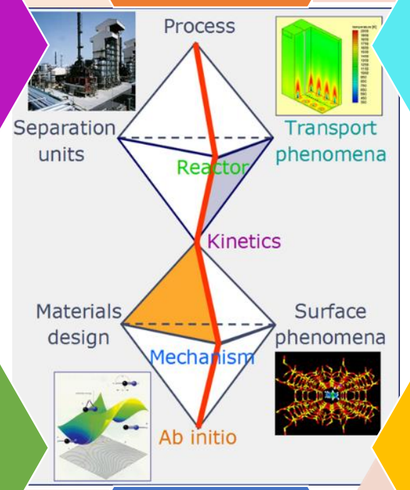
Reactor engineering

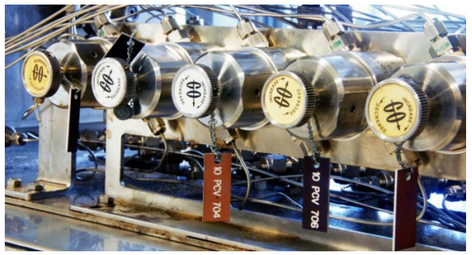
Catalyst design

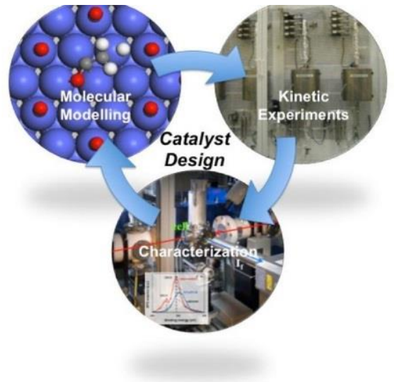
Renewable chemicals & technology

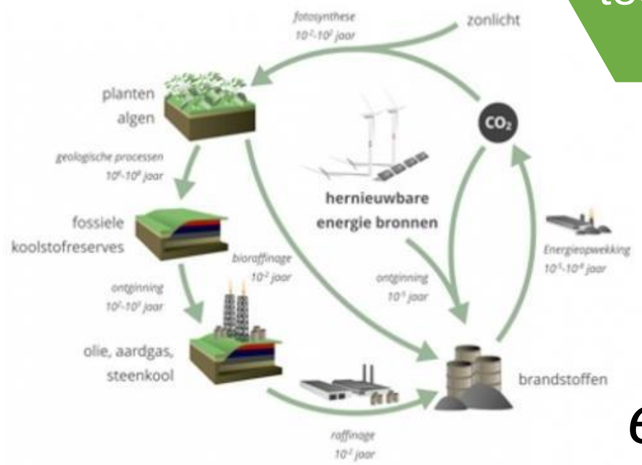
Circular Process design

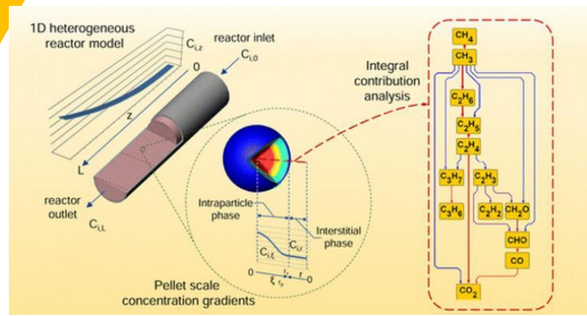
Low carbon technology











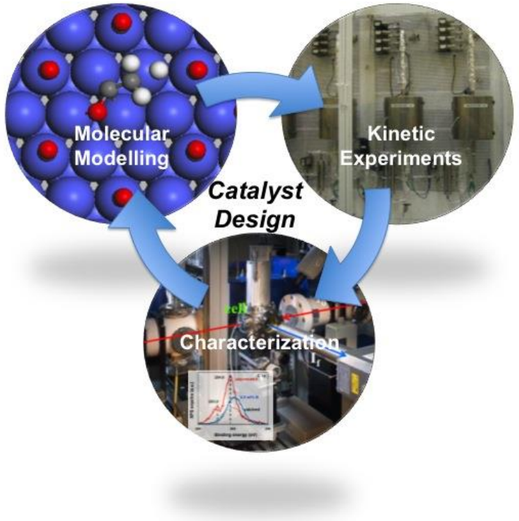
coordinators

every theme contains several topics;

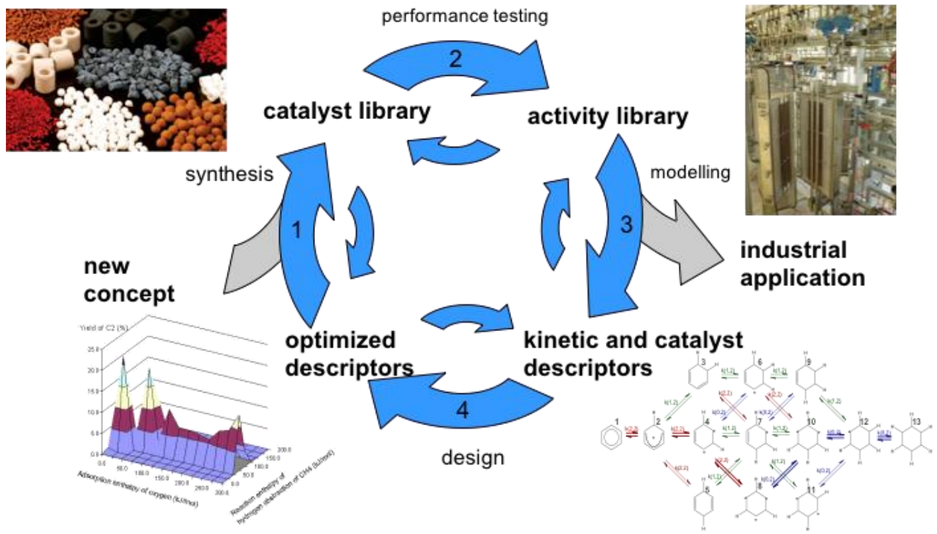
each researcher is active in at least two topics and themes

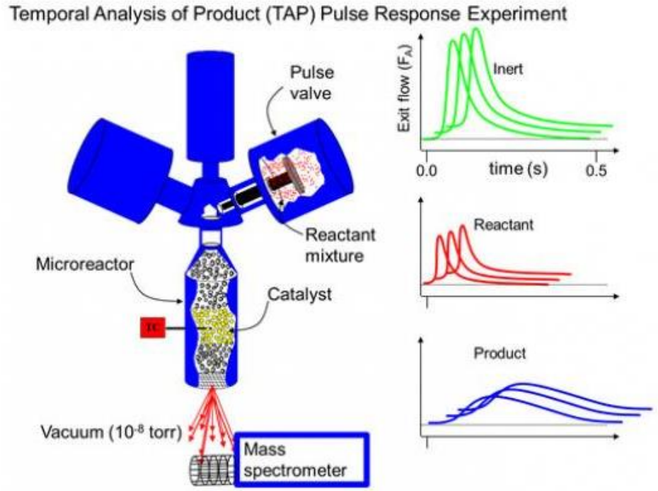
Theme 2: catalyst design

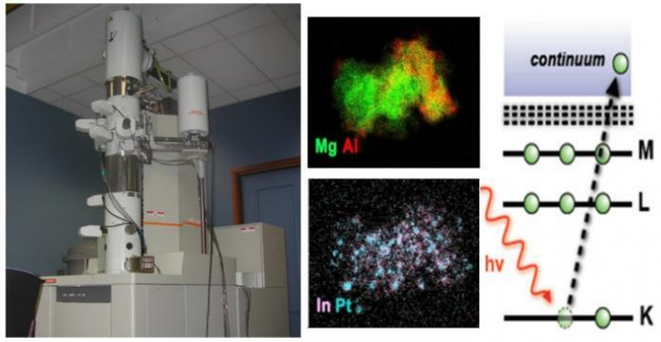
Modeling-guided



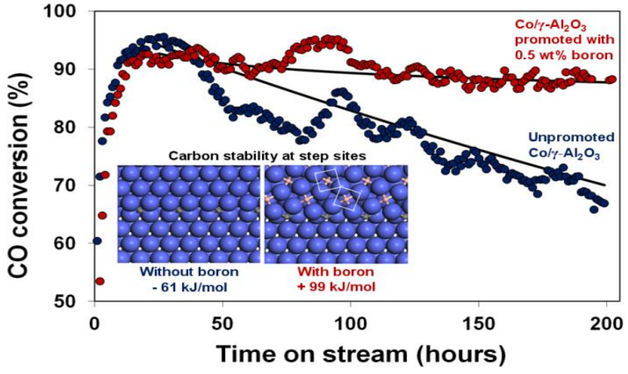
Kinetics-guided



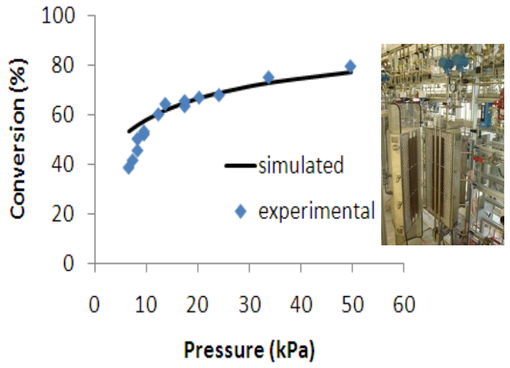


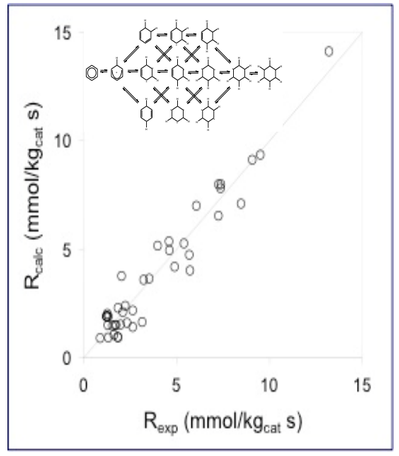


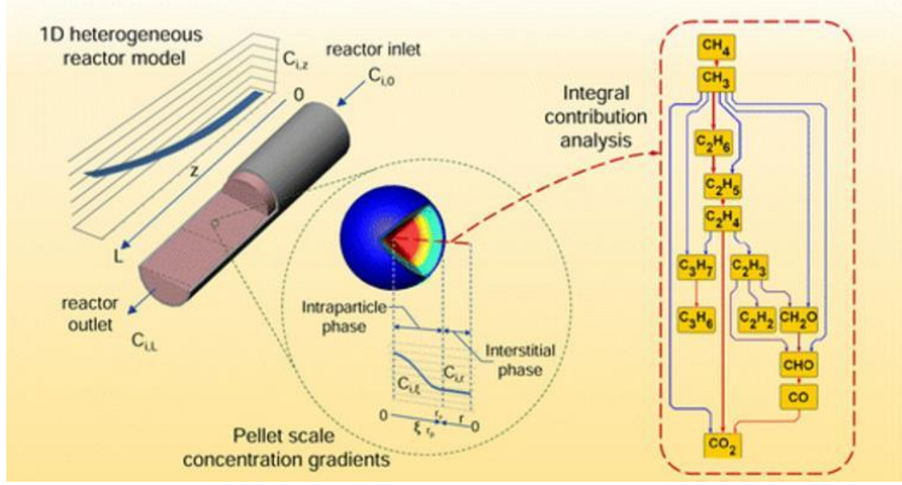
Boron-promoted Co



Accurate *ab initio* kinetics

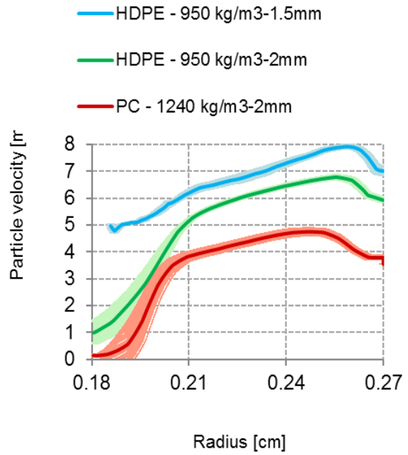


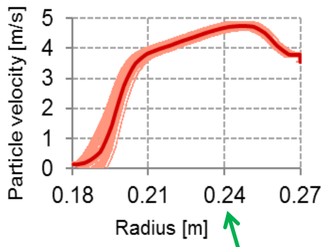


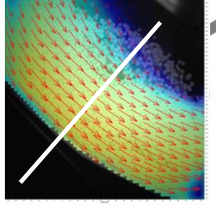


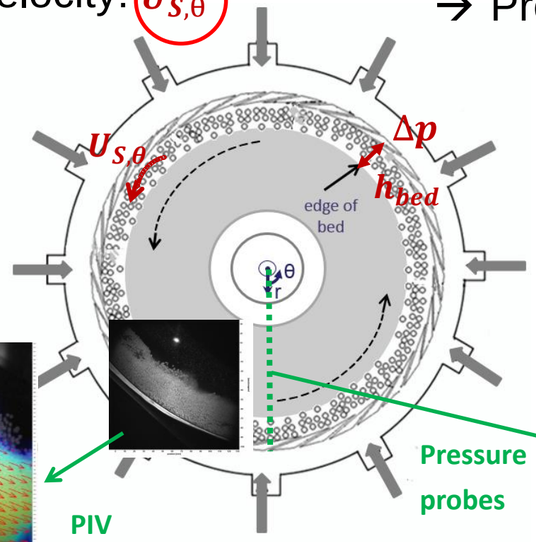
Theme 3: reactor engineering

- Solids **Velocity**
  Particle Image Velocimetry
  of solid phase near wall
- → Particle azimuthal velocity: $U_{S,\theta}$

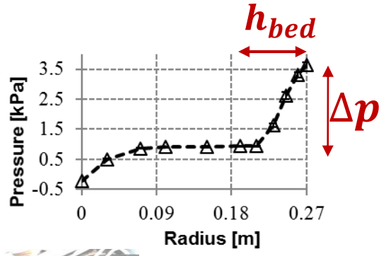


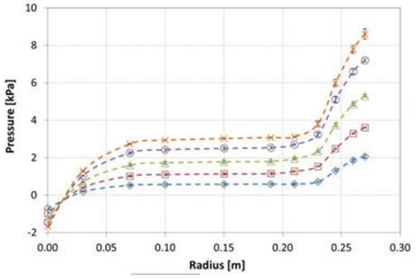






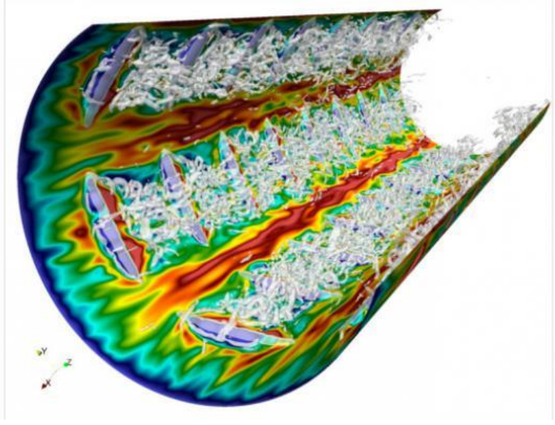
- **Static Pressure** profile
  Pressure probes at wall
- → Pressure drop over bed: Δp

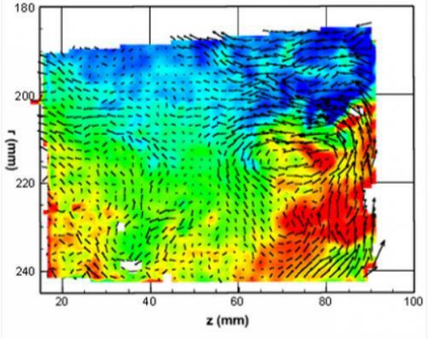


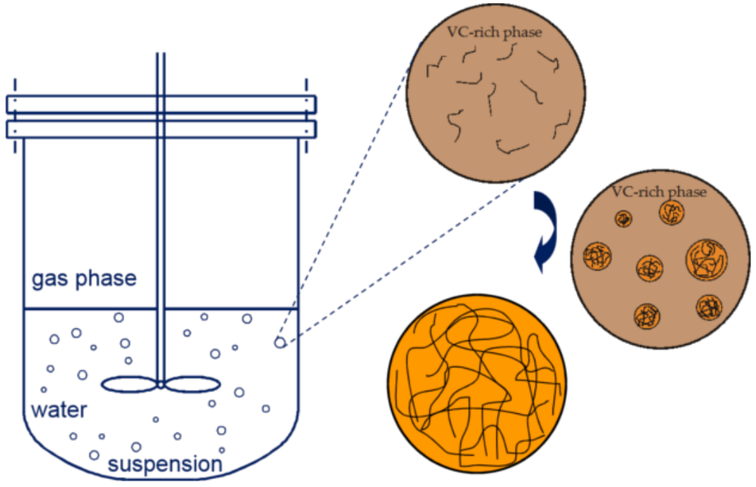


- Bed **Height:** h_{bed} → Void fraction: ε

observation, Pressure profile

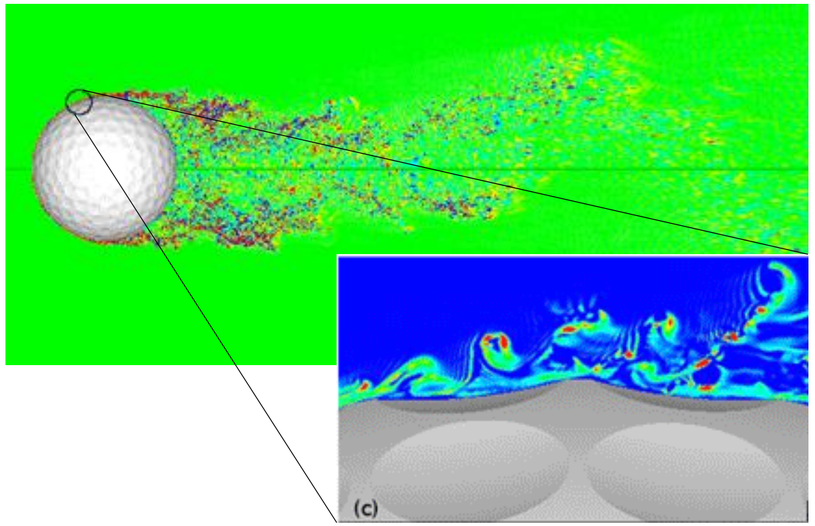




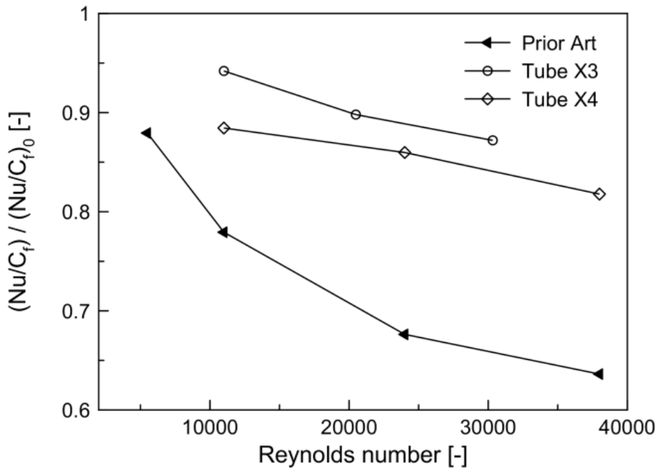


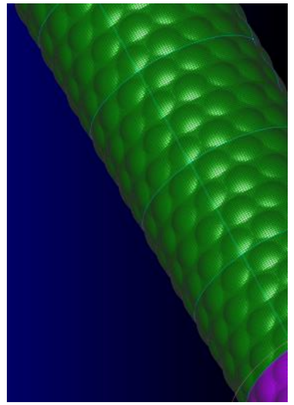
Dissemination also via patents

Well-known method of creating a turbulent boundary layer: **dimples** make golf balls fly further

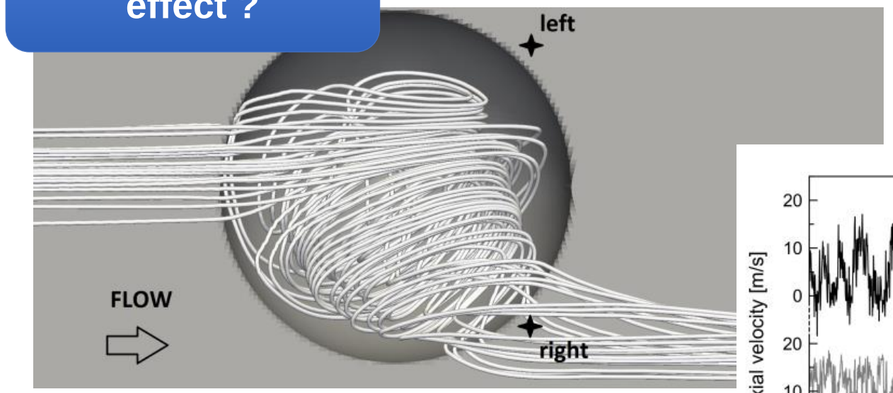


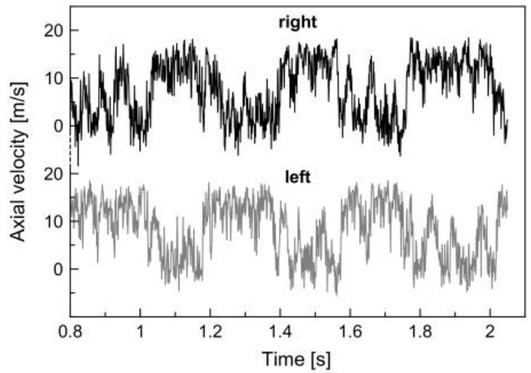
Improved heat transfer performance





Self-cleaning effect ?





Performance in an industrial propane cracker

	Finned	Ribbed	Dimpled
ΔP	+29 %	+297 %	+87 %
TMT_{max}	-27 K	-53 K	-45 K
$r_{cokes,\ max}$	-6 %	-50 %	-39 %
$C_2H_4 + C_3H_6$	-0.32 %	+0.40 %	+0.34 %

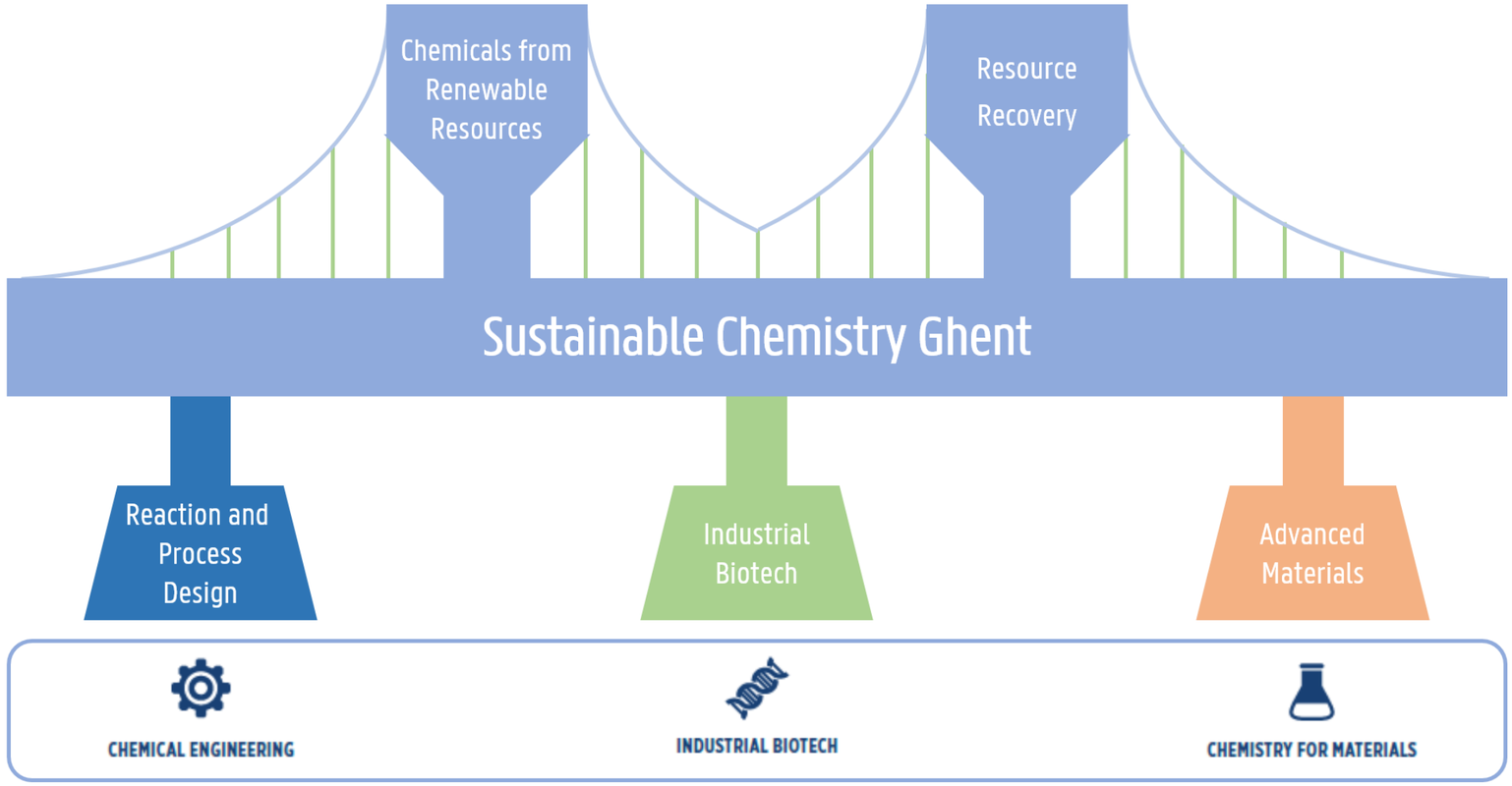
(*) Van Cauwenberge et al. 2017, WO 2017178551 A1

Member of Centre for Sustainable Chemistry

First point of contact:
Dr. E. Delbeke

Director:
Prof. K. M. Van Geem

Societal Challenge Innovation Programs



Key Enabling Technologies

Business Development

Collaboration:

Bio Base Europe Pilot Plant
CAPTURE
cmet
GHENT BIO-ECONOMY VALLEY
Green Chemistry Ghent
LCT DRIVING CHEMICAL TECHNOLOGY
SynBioC

LCT core expertise and challenges

- Design of sustainable products and processes guided by:

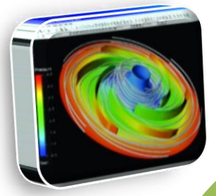
  modeling of complex kinetics

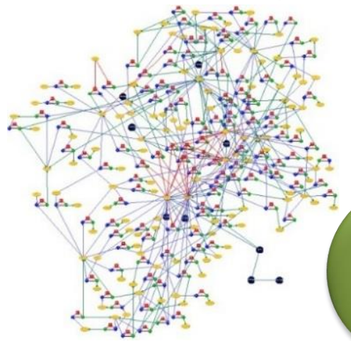
  combined with

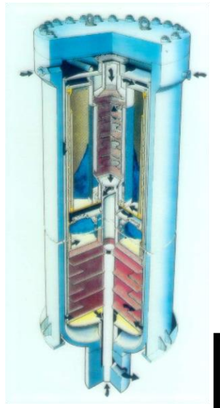
  complex transport phenomena

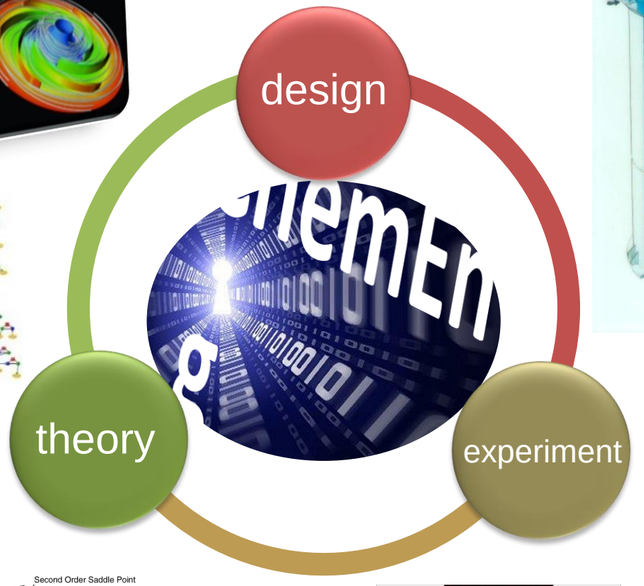
  based on:

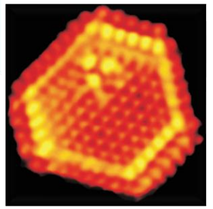
  - first principles
  - experimental validation

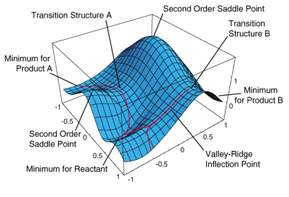


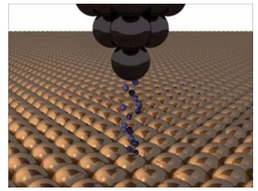


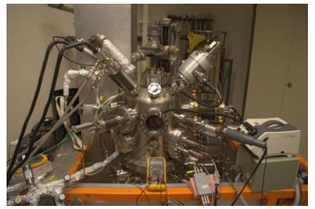












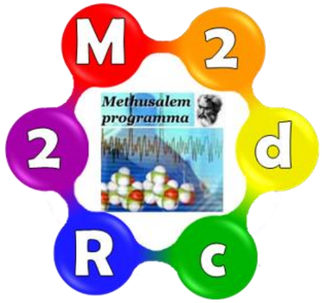
- Application domains
  - transportation fuels and energy carriers
  - chemicals
  - functional materials: catalysts & nanostructured polymers
  - reactors: 3D & vortex technology

Funding from Flemish to European level

Long Term Structural Methusalem Funding of the Flemish Government

European Research Council

Established by the European Commission



Strong industrial interaction

LABORATORY FOR CHEMICAL TECHNOLOGY

Technologiepark 125, 9052 Ghent, Belgium

E info.lct@ugent.be
T 003293311757

https://www.lct.ugent.be

GHENT UNIVERSITY

LCT
DRIVING CHEMICAL TECHNOLOGY

FACULTY OF ENGINEERING AND ARCHITECTURE

MECHANICAL RECYCLING OF POLYMERS

@ GHENT UNIVERSITY

prof. Kim Ragaert

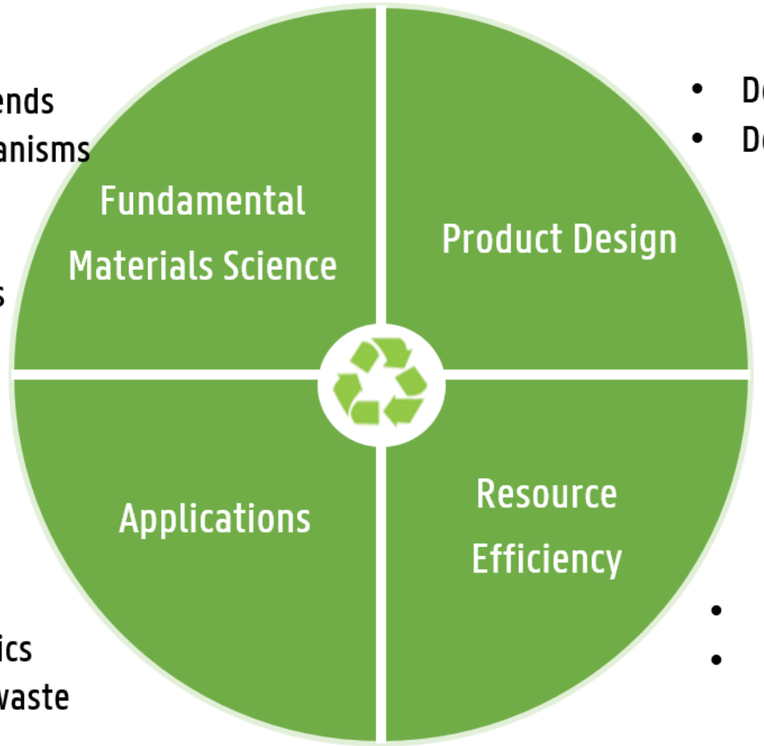
GHENT UNIVERSITY

Centre for Polymer and Material Technologies

CAPTURE

CPMT – TEAM RECYCLING

- Structure-property relationships in blends
- Degradation mechanisms
- Compatibilization
- Micro fibrillar composites



- Design from Recycling
- Design for Recycling

- WEEE
- Mixed plastics
- Packaging waste

- ‘Fit for use’ upcycling
- Quality prediction of mixed plastic waste

*Our **mission** is to contribute to the circular economy by **demonstrating the sustainable potential of plastics**.*

*This is achieved by transferring fundamental materials science to **improved industrial processing of recycled plastics**.*

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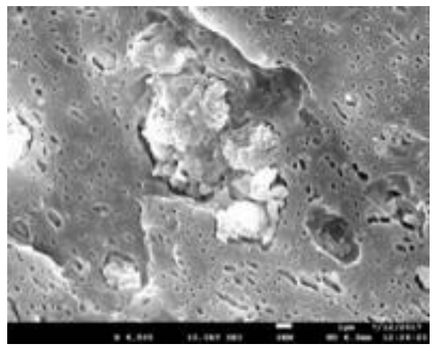
EQUIPMENT AT CPMT

- **Extrusion**: various single screw, twin screw (compounding TSE, conical TSE, reactive TSE) for sheet, filament and (blown) foil
- **Multilayer** Flaminco (unique Benelux): up to 5 layers (3 materials) in sheet and foil
- **Injection moulding** up to 80T
- **Thermoforming**
- **Characterization**: physicochemical (DSC, FTIR, TGA), optical (SEM, POM) , mechanical (tensile, impact, peel,…), ESCR, conductivity,…
- **3D printing** (various low cost, Stratasys UPrint SE, Felix 3, Pollen extrusion-based, Spiderbot, own developments)



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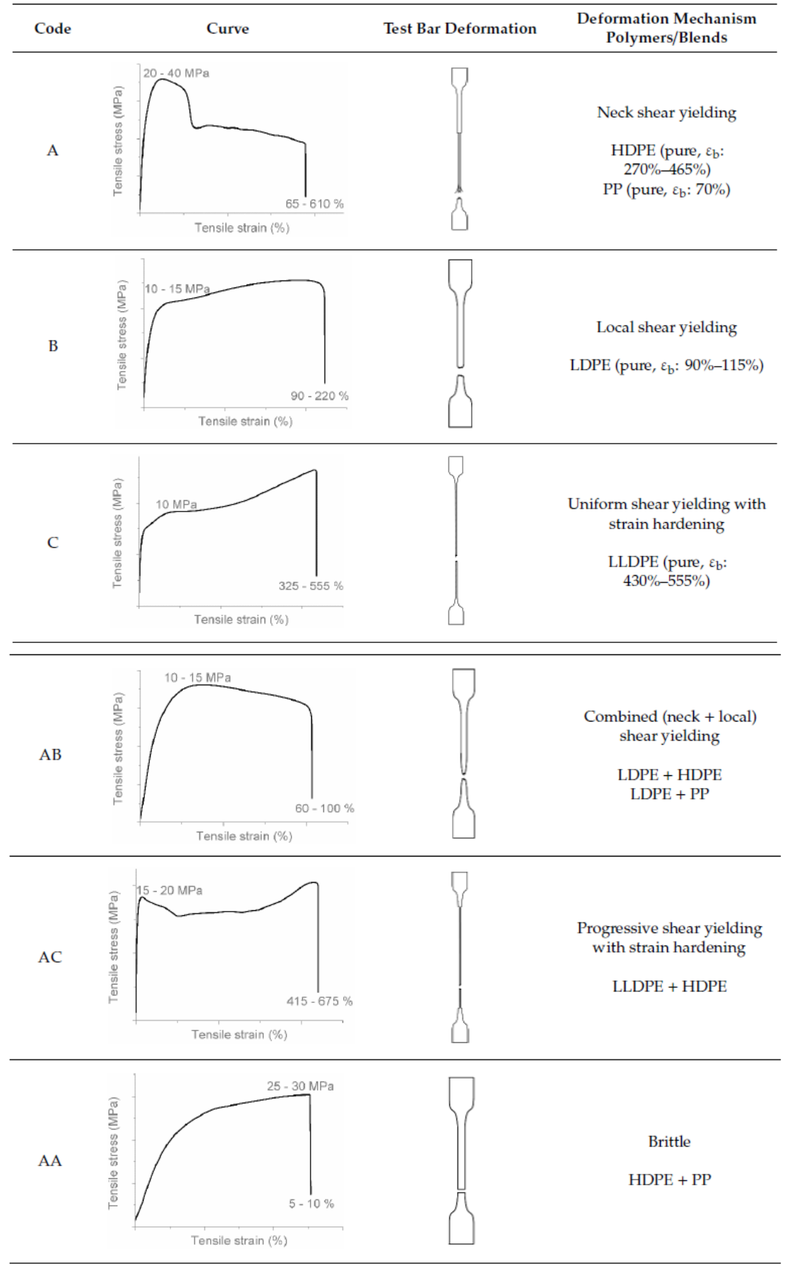
‘QR’ – THE QUALITY FOR RECYCLING OF A PRODUCT / WASTE STREAM

- Core theme of the research group
  - Focus thermoplastics, ‘big 5’ of packaging
  - To go beyond ‘observatory recycling studies’
  - Ties heavily into materials science of polymers
- ‘contamination’ = other thermoplastics, tie/barrier layers, adhesives, inks, labels,….
- ‘quality’ = (relative to uncontaminated virgin)
  - mechanical properties
  - Processability / fit-for-application
  - Other (odour, colour,…)



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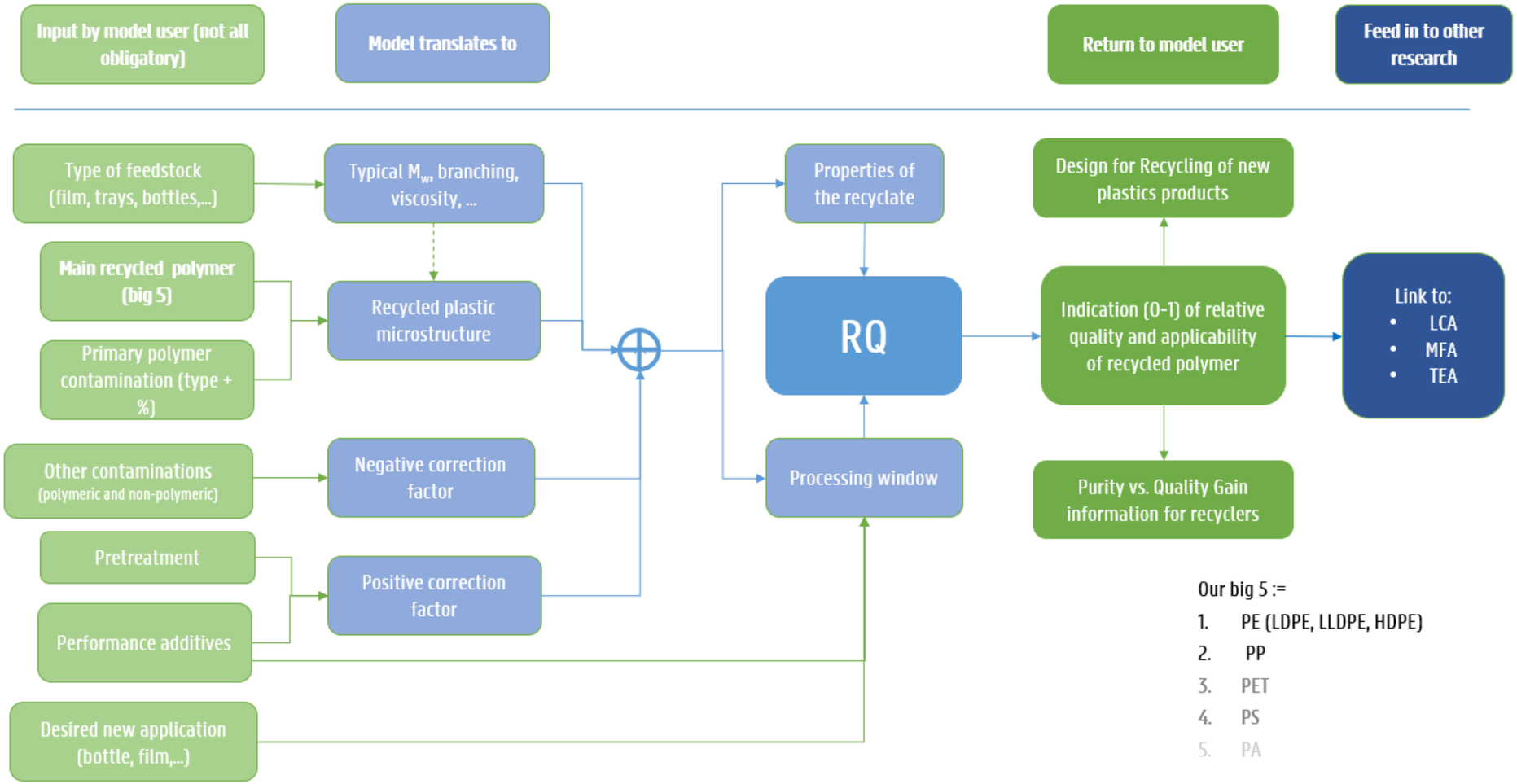
THE RQ OF A PRODUCT / WASTE STREAM – MODELED *RECYCLING QUALITY*



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FACULTY OF ENGINEERING AND ARCHITECTURE

Prof. Dr. Kim Ragaert
Sustainable Use and Recycling of Polymers

Chair of CAPTURE-Plastics to Resource
capture-resources.be

kim.ragaert@ugent.be
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Ghent University
Faculty of Engineering and Architecture
MATCH – CPMT (cpmt.ugent.be)

Tech Lane Ghent Science Park – campus A
Technologiepark 130
9052 Zwijnaarde, BE

Key publications:

- Astrid Van Belle , ..., and Kim Ragaert. Microstructural contributions of different polyolefins to the deformation mechanisms of their binary blends. (2020) Polymers.
- Kim Ragaert, Sophie Huysveld, Gianni Vyncke, Sara Hubo, Lore Veelaert, Jo Dewulf and Els Du Bois. Design from recycling: A complex mixed plastic waste case study. (2019) Resources, Conservation and Recycling. 155.
- Sophie Huysveld,Sara Hubo; Kim Ragaert; Jo Dewulf. Advancing circular economy benefit indicators and application on open-loop recycling of mixed and contaminated plastic waste fractions, Journal of Cleaner Production 211 (2019) .
- Thoden van Velzen U., Brouwer M., Augustinus A., Soethoudt I., De Meester S. and Ragaert K. Predictive model for the Dutch post-consumer plastic packaging recycling system. Waste Management 71 (2018), 62–854.
- Ragaert K.,Delva L. And Van Geem K. (2017). Mechanical and Chemical Recycling of Solid Plastic Waste. Waste Management 69 (2017) 24–58.
- Sofie Huysman, Jonas De Schaepmeester, Kim Ragaert, Jo Dewulf and Steven De Meester. Performance indicators for a circular economy: A case study on post-industrial plastic waste. Resources, Conservation and Recycling 120 (2017)

- Kim Ragaert. Plastics Rehab. TEDx Vlerick, Ghent, April 2019.

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CPMT Centre for Polymer and Material Technologies

CAPTURE PLASTICS TO RESOURCE

FACULTY OF ENGINEERING AND ARCHITECTURE

DEPARTMENT OF GREEN CHEMISTRY AND TECHNOLOGY

LABORATORY FOR CIRCULAR PROCESS ENGINEERING

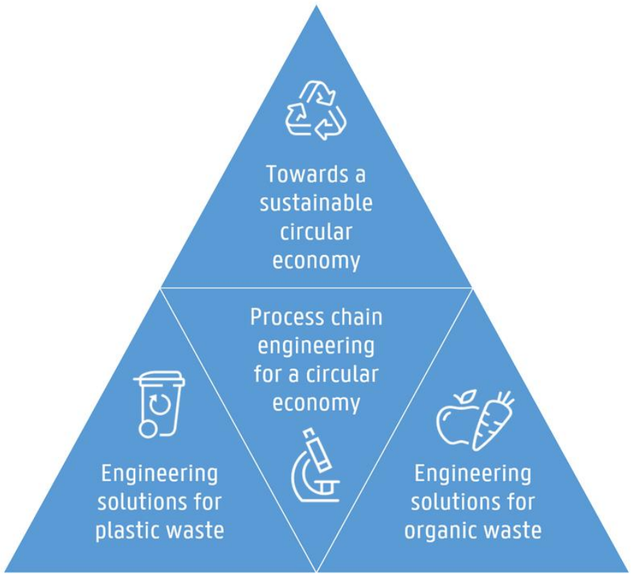
Prof. Steven De Meester

GHENT UNIVERSITY

LCPE
Laboratory for Circular Process Engineering

OUR GROUP

- Ghent University – Faculty of Bioscience Engineering – Department of Green Chemistry and Technology – Laboratory for Circular Process Engineering
- Started in 2016. Now a team of around 20 PhD students & 2 technicians
- Teaching:
  - Chemical engineering
  - Downstream processing
  - Thermal operations
  - Process intensification
  - Waste Management
  - Environmental Management



LCPE
Laboratory for Circular Process Engineering

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MAIN FOCUS

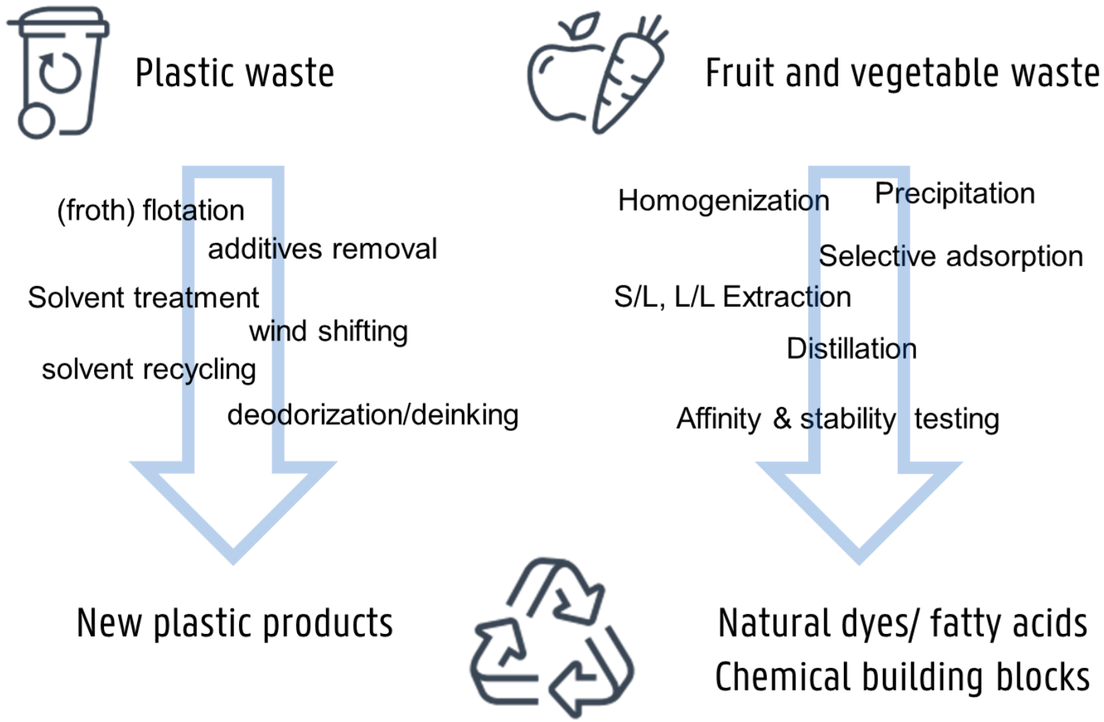
Strategy

➔ Characterisation of waste/product by chemical analysis

➔ Modeling the process (ASPEN) and the (new) process chain (MFA)

➔ Pilot experiments to develop or validate models

➔ Basic economic/environmental assessment



*example processes depicted

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INFRASTRUCTURE

Sample preparation

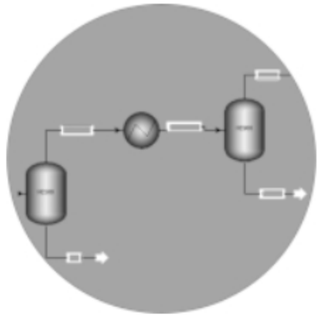
- Microwave digestion
- Cyrogenic mill
- Shredder
- Dry ashing
- Sieving

Analytics

- GC-MS
- GC-FID
- HPLC
- FT-IR
- TGA-IR
- DSC
- UV-VIS
- ICP-OES
- AAS
- Viscometer: Rotary and kinematic
- Colorimeter
- Conductometer
- Particle sizing (Laser Particle sizer, sieve analysis)

Unit operations

- Solid-liquid extraction
- Liquid-liquid extraction
- Continuous and batch distillation
- Density and froth flotation
- Pilot-scale friction washer
- Air classification/wind shifting
- Hydrocyclone
- Decanter centrifuge
- Drying
- Adsorption/desorption
- Precipitation
- Counter current gas absorption/stripping
- Filtration: pressure and sand filtration
- Column testing (Active carbon, Ion Exchange,...)



Process design with

- ASPEN Plus®
- Aspen HYSYS
- Aspen Heat Exchanger Design and Rating
- DoE with JMP and RStudio
- MATLAB
- Python
- Material flow analysis

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FROM OPEN-LOOP RECYCLING …

Mechanical recycling of plastic foils results in black granulates

Black granulates can only be used in ‘low-grade’ applications like garbage bags

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… TO CLOSED-LOOP RECYCLING

Mechanical recycling of plastic foils can result in ‘virgin-grade’ granulates reusable in ‘high-grade’ applications

Pretreatment step(s) to remove

- **labels**
- **colour**
- **odour**
- **polymeric contamination**
- **organics**
- **additives**
- **other ‘problematic’ impurities**

Our main focus

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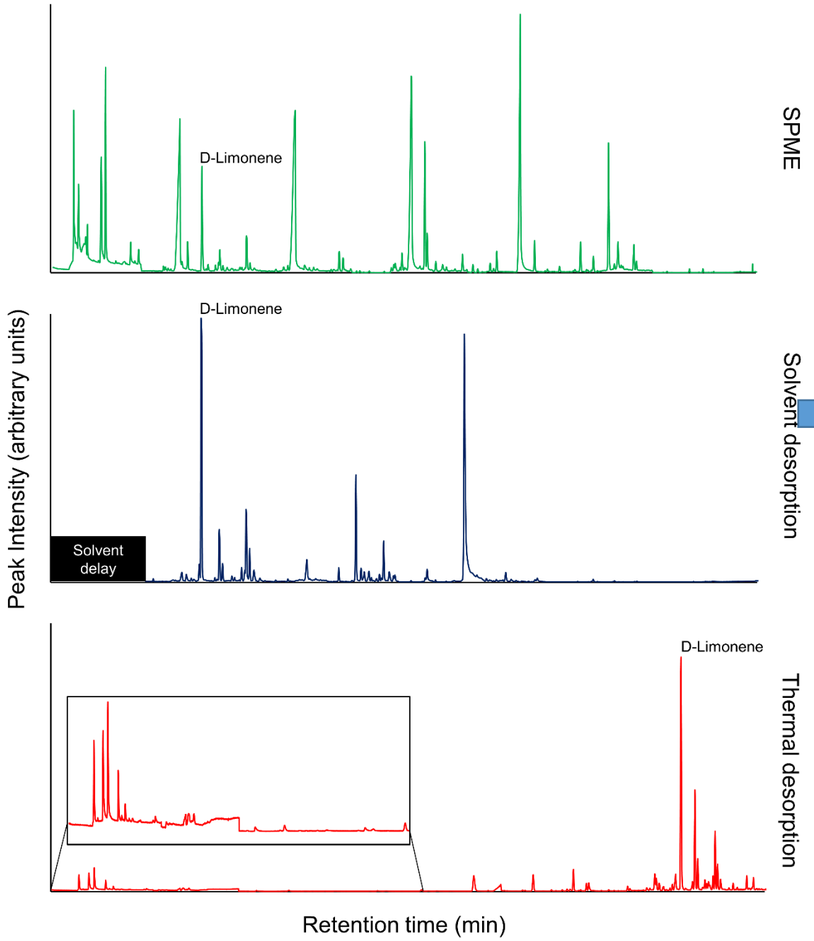
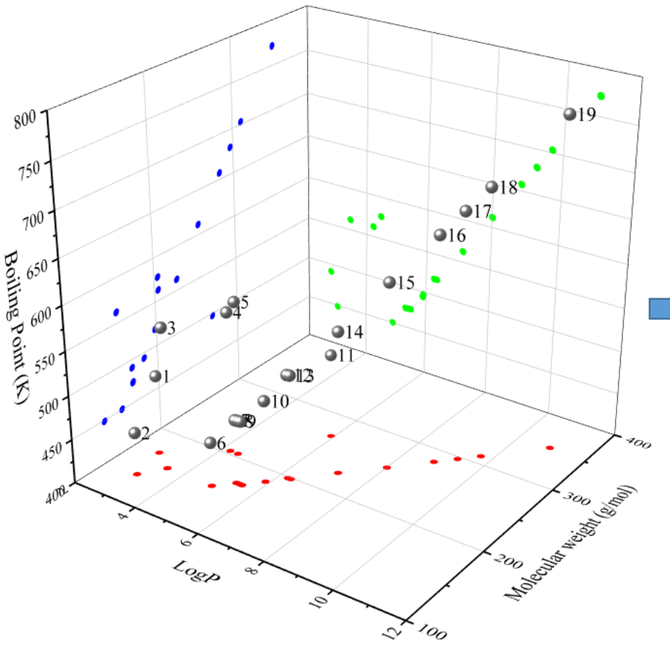
DEODORIZATION OF PLASTIC WASTE

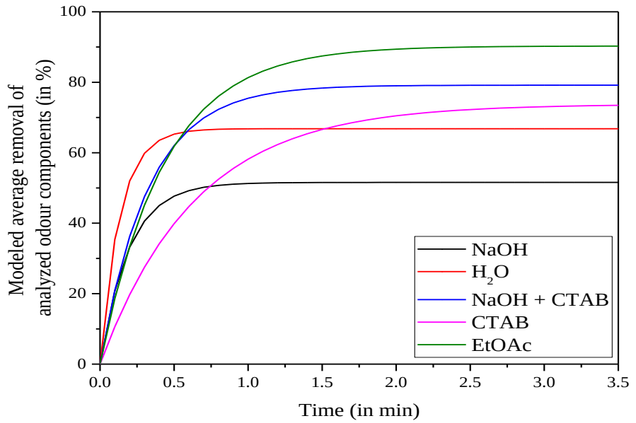
Comparison of 3 different GC-MS methods





Selection of odor components with varied boiling point, LogP value, and MW

Kinetic model	Equations
Zero-order	$\frac{dq}{dt} = -k_{0,des}$
First order	$\frac{dq}{dt} = -k_{1,des} * q$
Second-order	$\frac{dq}{dt} = -k_{2,des} * q^2$
Pseudo first-order	$\frac{dq}{dt} = k_{P1,des} * (q_e - q)$
Pseudo second-order	$\frac{dq}{dt} = k_{P2,des} * (q_e - q)^2$
Reversible first-order	$\frac{dq}{dt} = -k_{RFO,1} * q + k_{RFO,2} * C$
Langmuir	$\frac{dq}{dt} = k_{LK}\left[\frac{(q_0 - q) * m}{V} * (q_{m_L} - q) - \frac{1}{b_{LK}} q\right]$



Comparison of various conventional and advanced washing treatments

Contents lists available at ScienceDirect
Resources, Conservation & Recycling
journal homepage: www.elsevier.com/locate/resconrec
Full length article

Development and application of an analytical method to quantify odour removal in plastic waste recycling processes

Ruben Demets[a,b], Martijn Roosen[a], Lore Vandermeersch[c], Kim Ragaert[b], Christophe Walgraeve[c], Steven De Meester[a,*]

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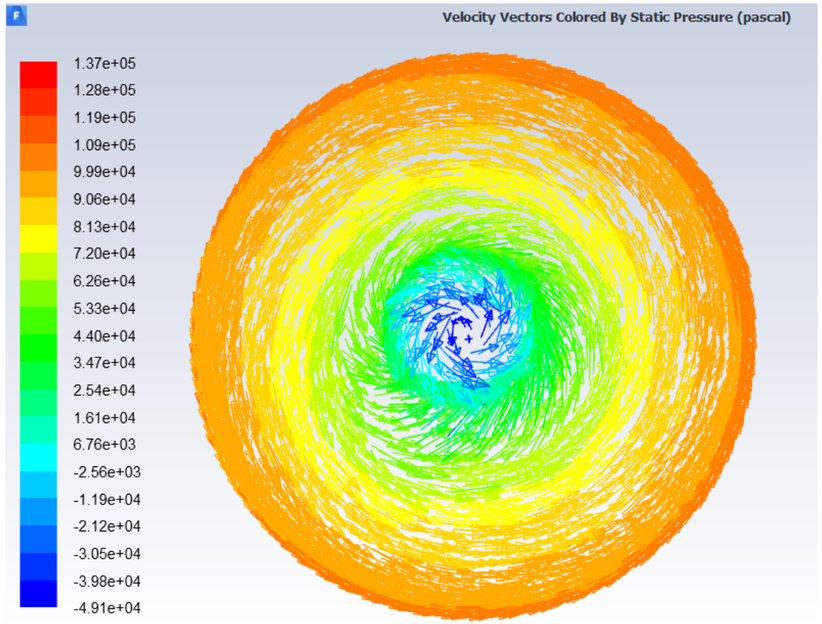
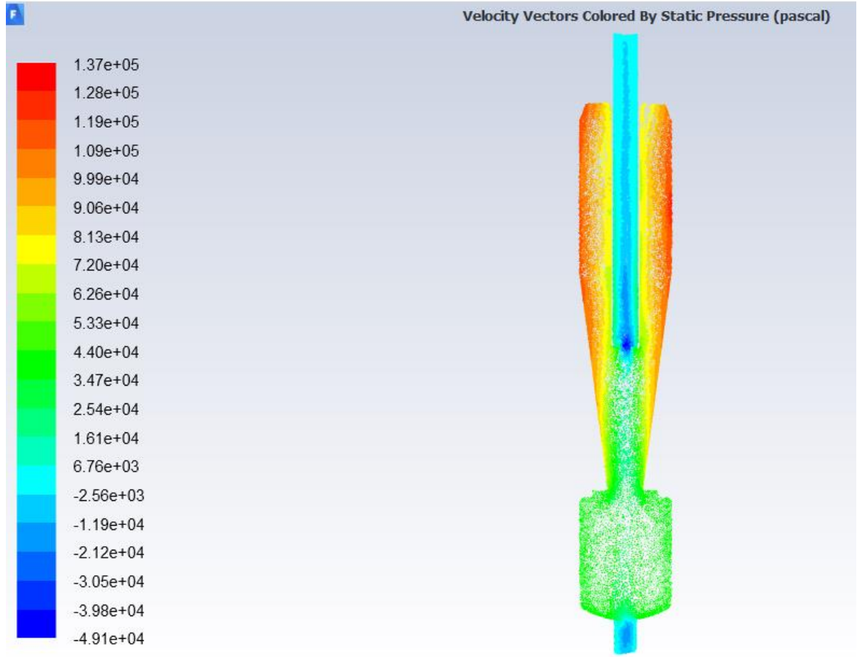
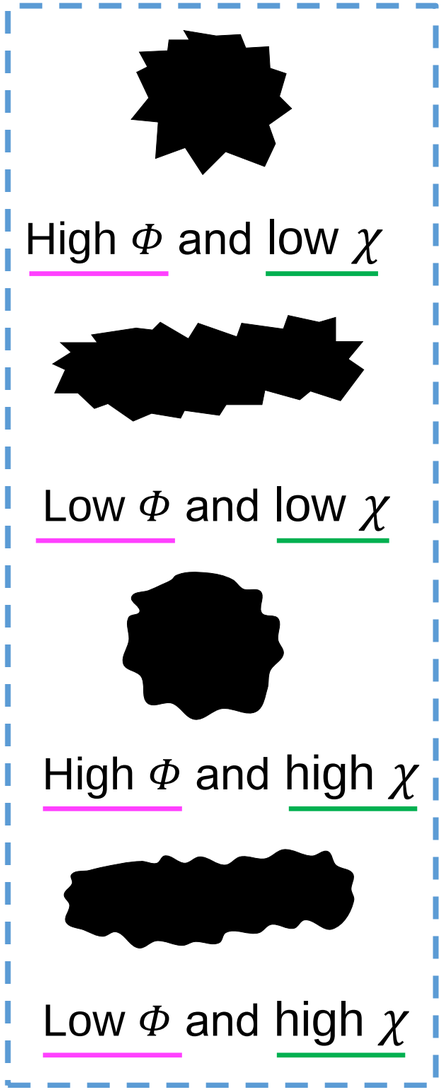
FLOTATION SEPARATION

— Plastics floating/sinking behavior?





$$C_D = \frac{24}{Re_p}\left(\frac{1-\Psi}{Re_p}+1\right)^{0.25} + \frac{24}{Re_p}\left(0.1806\,Re_p^{0.6459}\right)\Psi^{-Re_p^{0.08}} + \frac{0.4251}{1+\frac{6880.95}{Re_p}\Psi^{5.05}}$$



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Contaminants in Aquatic and Terrestrial Environments

Characteristics and Sinking Behavior of Typical Microplastics including the Potential Effect of Biofouling: Implications for Remediation

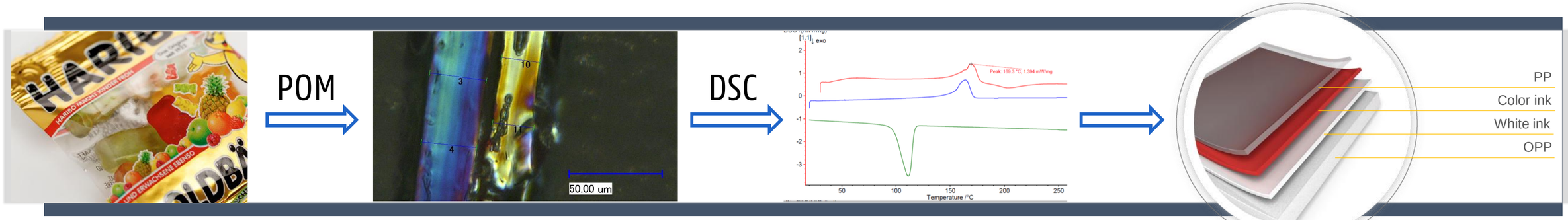
Michiel Van Melkebeke, Colin R. Janssen, and Steven De Meester

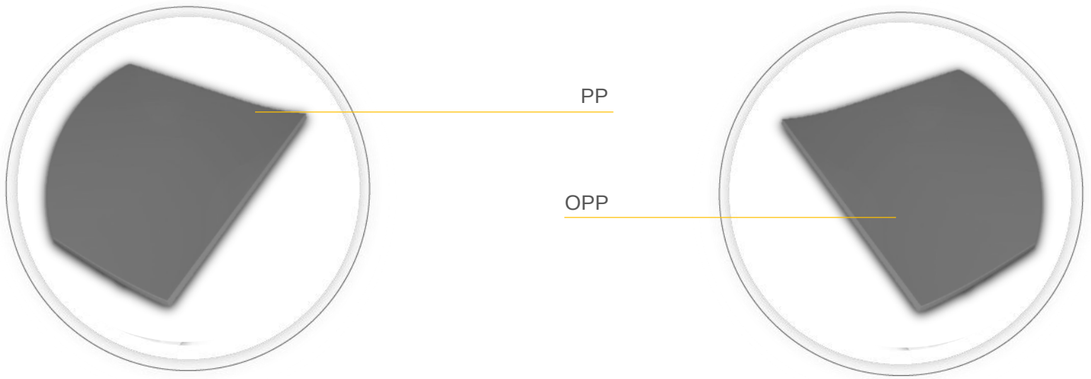
Environ. Sci. Technol., **Just Accepted Manuscript** • DOI: 10.1021/acs.est.9b07378 • Publication Date (Web): 18 Jun 2020

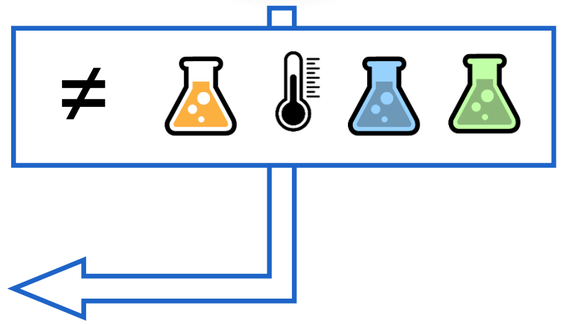
DEINKING / DELAMINATION

Quantitative overview of removal efficiencies of impurities by existing washing and separation steps

- **Deinking / delamination experiments on representative products**
  - Optimizing procedure: testing of different media and different temperatures







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DELAMINATION & DEINKING OF PLASTICS

Deinking and delamination of ‘real’ packaging

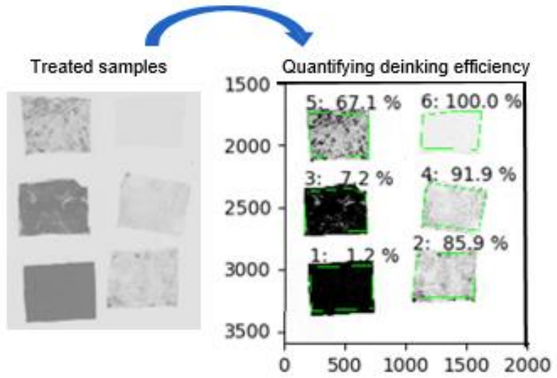
Treatment*

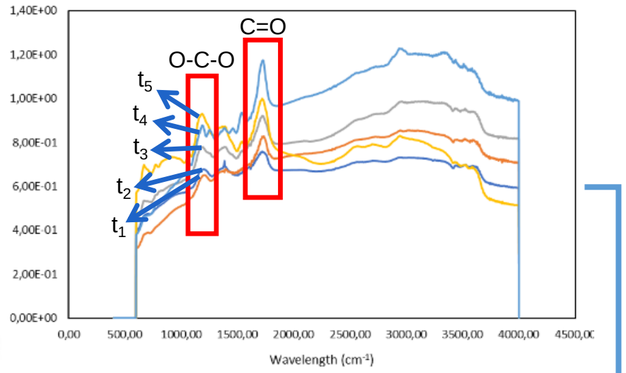
*Patent application filed

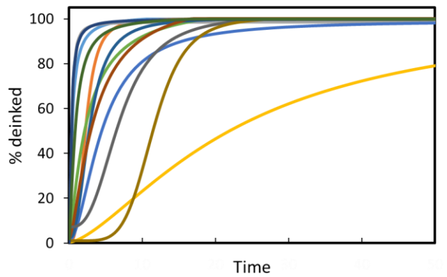
Process optimization via standardized samples

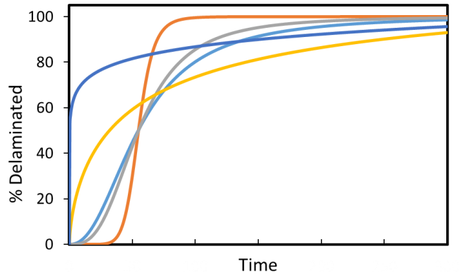
Quantification of deinking via image color mapping

Quantification of delamination via FT-IR









Process optimization

- S/L ratio
- Particle size
- Temperature
- Shear rate…

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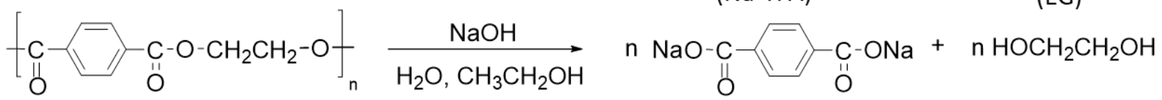
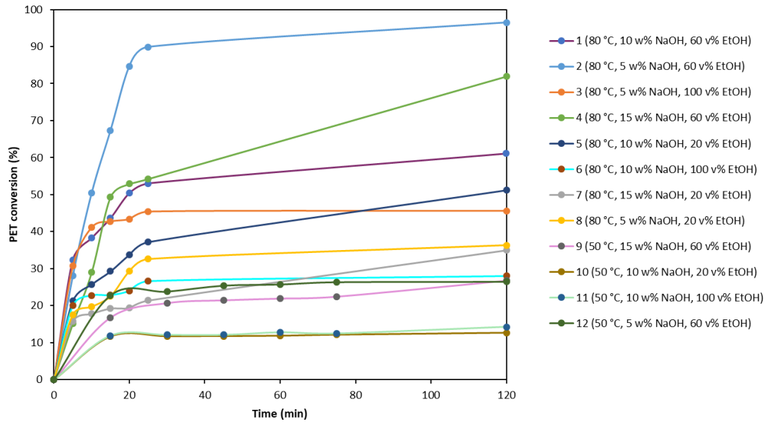
SELECTIVE HYDROLYSIS

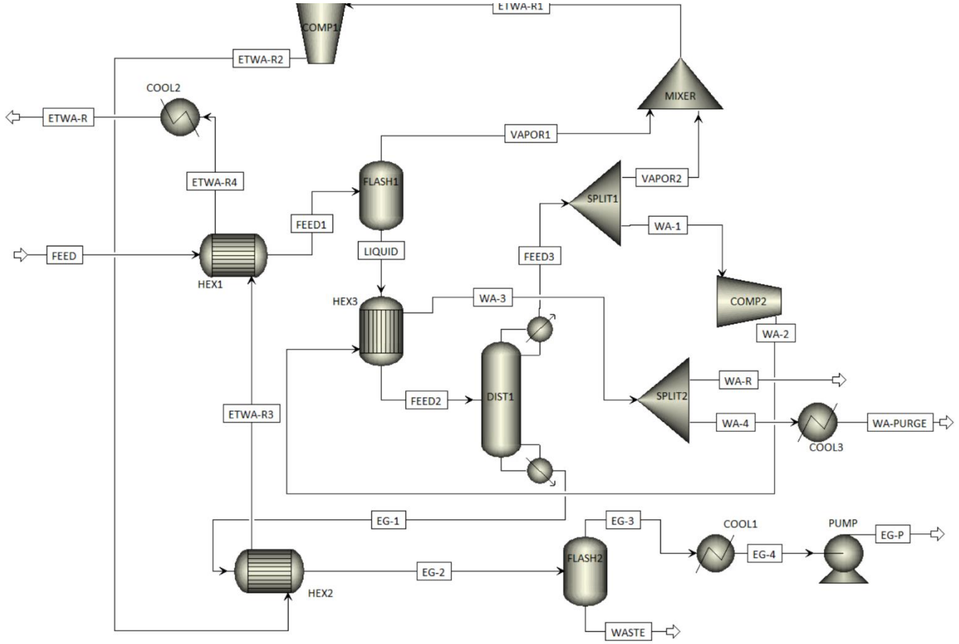
(1)



(2)



Type of PET	Thickness (mm)	Specific surface area (m^2/g)	Crystallinity (%)
multilayer tray	0,35	0.0025	7.26
multilayer film	0,045	0.0192	12.49
bottle	0,27	0.0062	33.15
monolayer tray	0,16	0.0052	11.73
monolayer film	0,035	0.0213	30.77
pure PET pellets	2,5	0.0003	41.28



Green Chemistry

PAPER

View Article Online
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Check for updates

Cite this: DOI: 10.1039/d0gc00894j

Towards closed-loop recycling of multilayer and coloured PET plastic waste by alkaline hydrolysis†

Sibel Ügdüler,[a] Kevin M. Van Geem,[b] Ruben Denolf,[a] Martijn Roosen,[a] Nicolas Mys,[a,c] Kim Ragaert[c] and Steven De Meester*[a]

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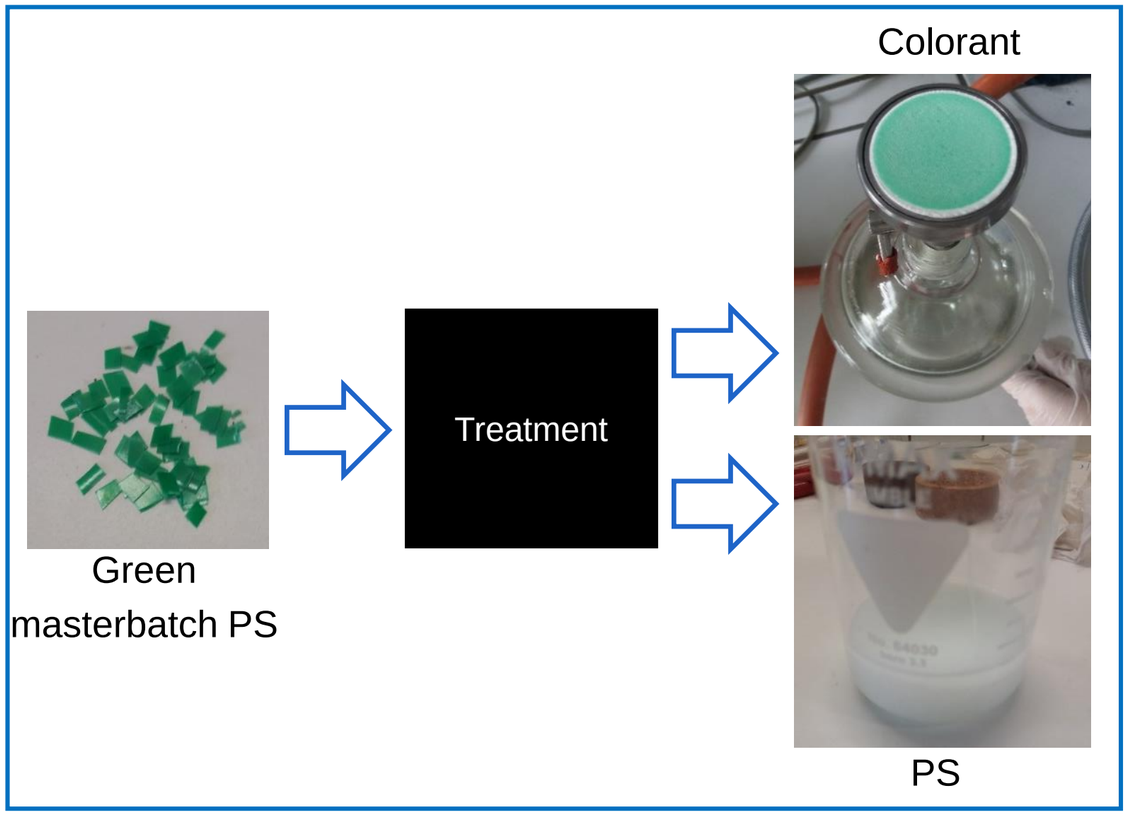
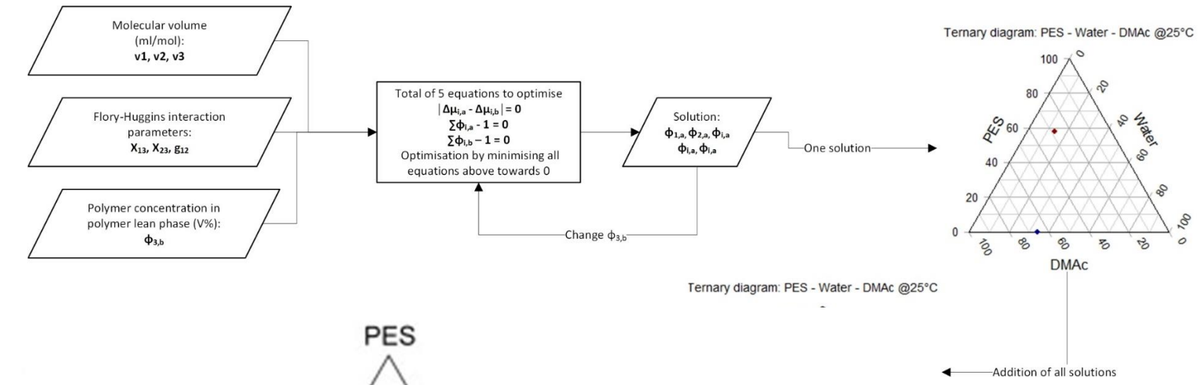
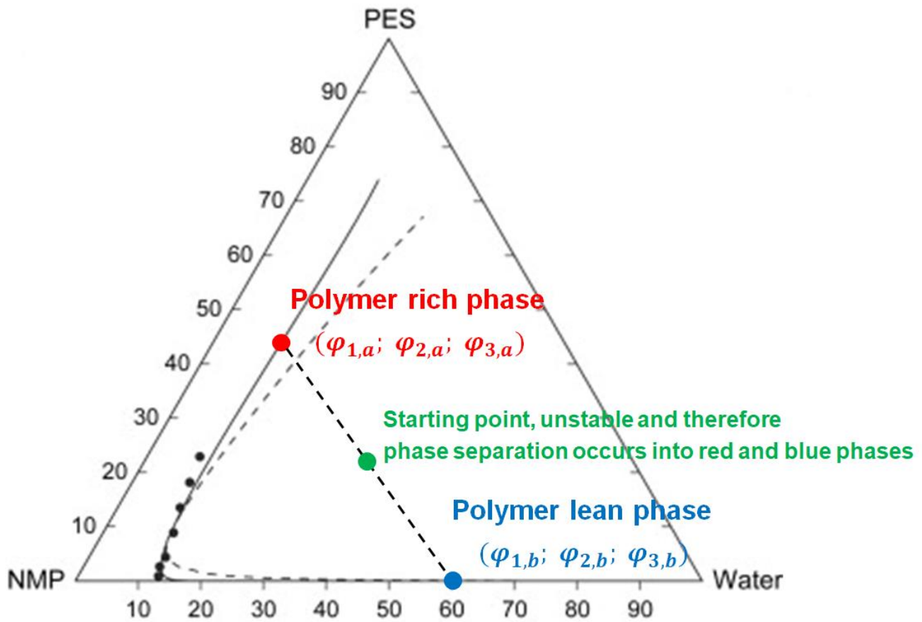
Dissolution - precipitation







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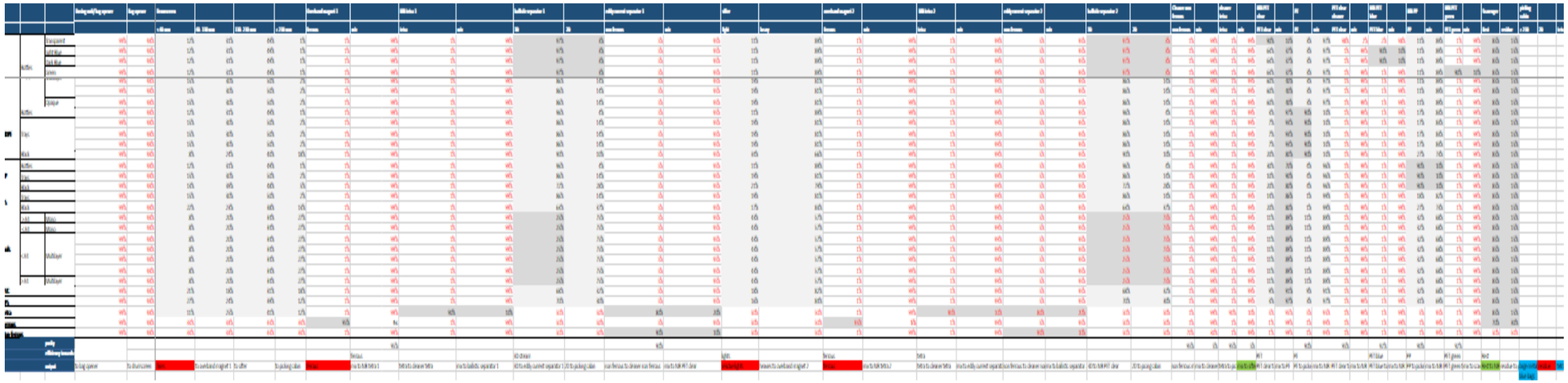
FROM MODELING THE PROCES TO MODELING THE (NEW) PROCESS CHAINS

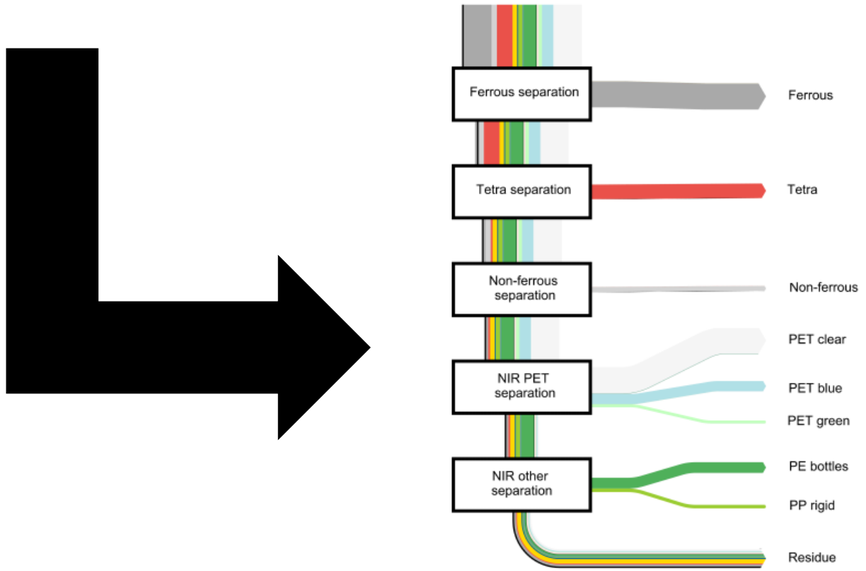
Sorting efficiencies for plastics in separation processes



- Puzzle the flowsheet together based on sorting efficiencies
- Input-Output calculations

$$f^m = (I - (Q^m)^T) * \mu^m$$

- Cross contamination matrix



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OVERVIEW OF PROJECTS

COOCK Circopack
(2019 - 2022)

CIRCOPACK

Future packaging policy for the circular economy

Contact: prof. Steven De Meester (e-mail)

Marie Curie EJD: C-Planet
(2020-2024)

C-PlaNeT
CIRCULAR PLASTICS NETWORK FOR TRAINING

Circular economy for plastic

Contact: prof. Steven De Meester (e-mail)

Catalisti ICON MATTER
(2018-2020)

MATTER
Mechanical and Thermochemical Recycling of mixed plastic waste

Mechanical and Thermochemical Recycling of Mixed Plastic Waste

Contact: Nicolas Mys (e-mail)

Catalisti ICON P2PC
(2019-2022)

P2PC
Plastic to Precious Chemicals

Pyrolysis of waste plastics

Contact: prof. Steven De Meester (e-mail)

INTERREG PlastiCity
(2019-2022)

Interreg
2 Seas Mers Zeeën
PlastiCity

Industrial and commercial plastic waste recycling in urban environments

Contact: Kerstin Kleinhans (e-mail)

Catalisti ICON PROFIT
(2017-2020)

PROFIT

Plastic recuperation and valorisation fit for use

Contact: Ruben Demets (e-mail)

INTERREG PSYCHE
(2018-2022)

Interreg
France-Wallonie-Vlaanderen

PSYCHE

Conversion of plastic waste to basic chemicals via gasification

Contact: Sibel Ügdüler (e-mail)

SBO Solvation
(2019-2023)

Separate polymers from their additives through a dissolution/swelling and precipitation process

Contact: Ruben Denolf (e-mail)

Macerate
(2020-2021)

MACERATE

Delamination and deinking of plastic waste: a game-changer towards closed-loop plastic recycling

Contact: Martijn Roosen (e-mail)

Vlaanderen Circulair
(2018-2022)

VLAANDEREN CIRCULAIR

Indicators for the circularity of products

Contact: Gustavo Moraga (e-mail)

SBO WATCH
(2019-2023)

WATCH

New disruptive technology for the conversion of plastic waste to chemicals via catalytic fast pyrolysis

Contact: Martin Skelton (e-mail)

H2020 REACT
(2019-2022)

REACT

Managing the waste acrylic textiles

Contact: Brecht Tomme (e-mail)

Baekeland Oleon
(2017-2021)

Vlaanderen
verbeelding werkt

Renewable raw materials in the oleochemical industry

Contact: Pieter Nachtergaele (e-mail)

BOF project: Natural dyes from food waste
(2017-2021)

Contact: Kim Phan (e-mail)

ITN AGREFINE
(2020-2024)

ITN AGREFINE

New raw material from agricultural residues

Contact: prof. Steven De Meester (e-mail)

INTERREG ALPO
(2017-2020)

Interreg
France-Wallonie-Vlaanderen

GoToS3
ALPO

New polymer-based materials from microalgae
Contact: prof. Steven De Meester (e-mail)

VLIR: food and textile waste recycling in Kenya
(2018-2021)

vliruos
SHARING MINDS, CHANGING LIVES

Natural dyes from nut waste

Contact: Benson Dulo (e-mail)

FACULTY OF ENGINEERING AND ARCHITECTURE

Prof. Dr. Ir. Steven De Meester

DEPARTMENT OF GREEN CHEMISTRY
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DEPARTMENT OF POLITICAL SCIENCES
RESEARCH GROUP CENTRE FOR SUSTAINABLE DEVELOPMENT

THE CENTRE FOR SUSTAINABLE DEVELOPMENT

A BRIEF PRESENTATION

Prof. dr. Erik Paredis

GHENT UNIVERSITY

C-PlaNeT _ Network Training Event 1 – September 7-10, 2020

THE CSD IN BRIEF

- Founded in 1995
- Research group of the **Department of Political Sciences** (UGent)
- **Multidisciplinary** research centre (but transdisciplinarity is a key aspect)

Sustainable Cities

Science, Technology and Politics

Indicators, Assessments and Monitoring

Sustainability Education

Transitions and Future Studies

Website:
www.cdo.UGent.be

- 2 associate professors (and soon 3) and +/- 20 researchers

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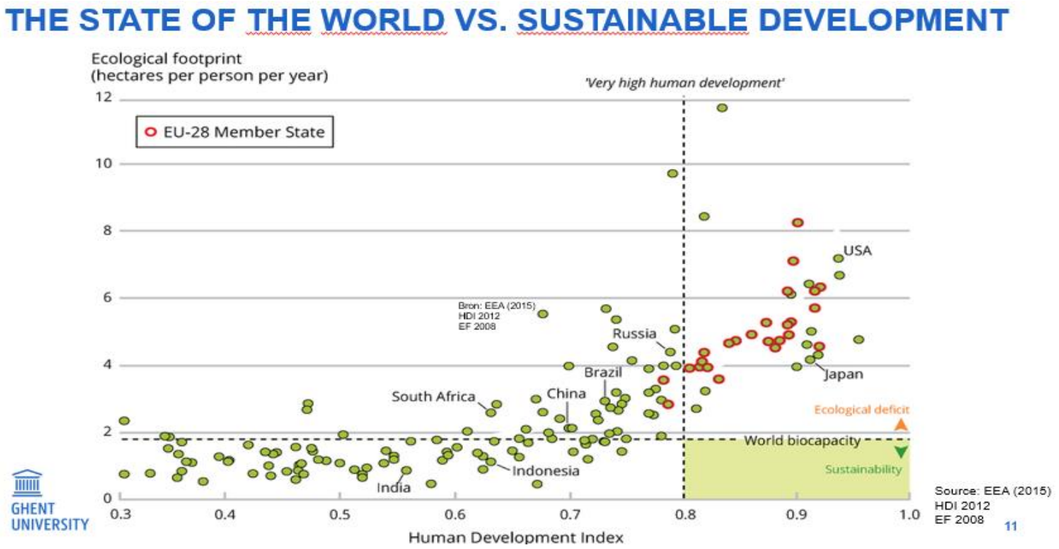
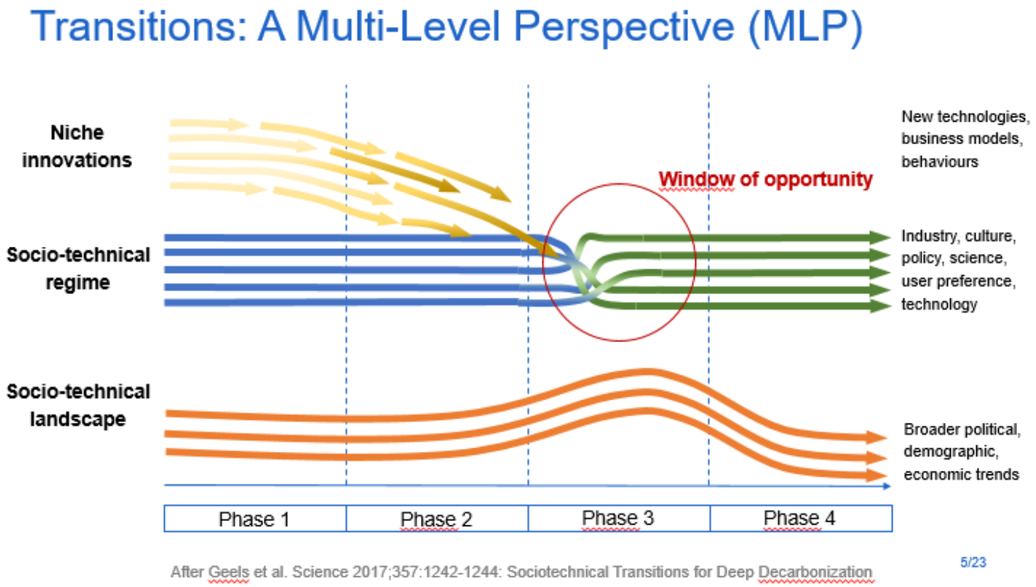
MAIN ELEMENTS OF OUR APPROACH (1)

- Normative background: **the search for a more sustainable society**: quality of life, justice, ecological limits, democracy, inter- and intragenerational





- **Sustainability Transition studies**: Why is socio-technical system change needed (energy, mobility, agrofood…)? How do systems change? What is the role of niches? How do regimes resist?

MAIN ELEMENTS OF OUR APPROACH (2)

- **Critical, interpretive policy analysis**: who gets what, why and how? What is the role of power and interests, interpretation, discourse? Who wins, who loses? What are implications for governance?

- **Science and technology studies**: how do technology, science and society interact and shape each other? How and why do technology developers make choices? What are the consequences?

RESEARCH IN CIRCULAR ECONOMY

- This is one of our first research project about plastics

- But we have a series of **projects about the societal and political implications of the circular economy:**
  - Resource, product and energy recovery from wastewater: the politics of the circular economy in wastewater systems
  - Socio-technical politics of industrial transformation (CCU, hydrogen, synfuels…)
  - Socio-technical niche analysis of smart sorting technologies for end-of-life polyurethane (PU)

  - The role of product-service combinations in the circular economy (b-to-b and b-to-c)
  - The role of care and repair in the CE transition
  - Regional and spatial dynamics of the CE transition

  - What is the role of design (and designers) in the transition towards more sustainable futures?

OUR ROLE IN C-PLANET

- Promotor and host for ESR 13 (Nur Gizem Yalcin): “Politics and governance in a circular plastics economy”

- Promotor and co-host for ESR 5 (Fernando Lit): “New strategies and business models for a circular plastics transition”

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RESEARCH UNIT PACKAGING TECHNOLOGY

Prof. dr. ir. Peter Ragaert

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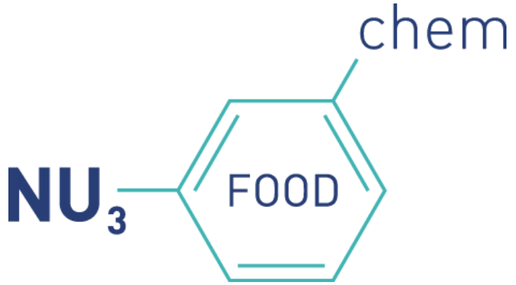
CAPTURE

RESEARCH UNIT: PACKAGING TECHNOLOGY

- Close collaboration in the department Food Technology, Safety and Health with

Prof. dr. ir. Frank Devlieghere



Prof. dr. ir. Bruno De Meulenaer

PACKAGING TECHNOLOGY

- Research on relation between **packaging requirements** and **shelf-life** (food quality and food safety,) focussing on:
  - Biobased and recycled plastics
  - Active and intelligent packaging
    - Antimicrobial packaging
    - Sensors to monitor shelf-life
  - New barrier materials (e.g. coatings)

EXPERTISE/INFRASTRUCTURE ON PACKAGING

- Packaging experiments with food products in different conventional, biobased & recycled packaging
- Measuring/modelling O_2-concentrations in packages
- Analysis of volatile organic components (VOC's) in relation to packaging configuration
- Relation between gas composition in headspace and microbial / chemical processes in food

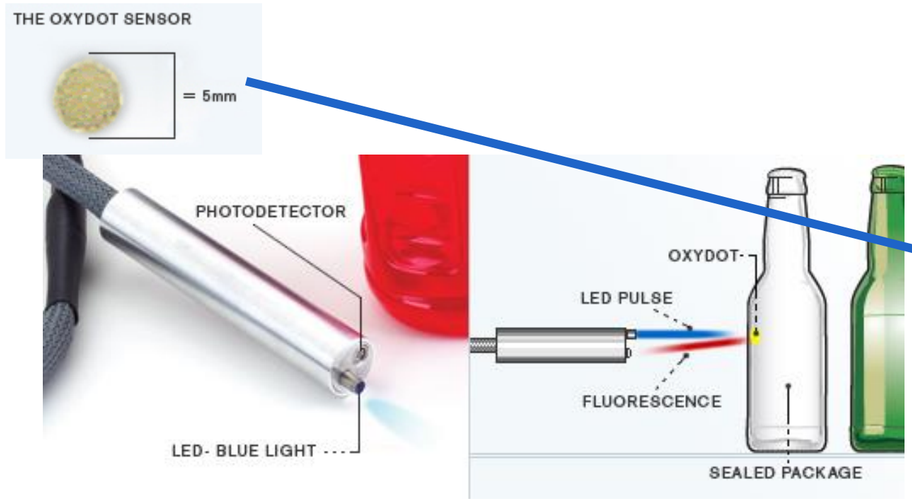


Photo: Oxysense

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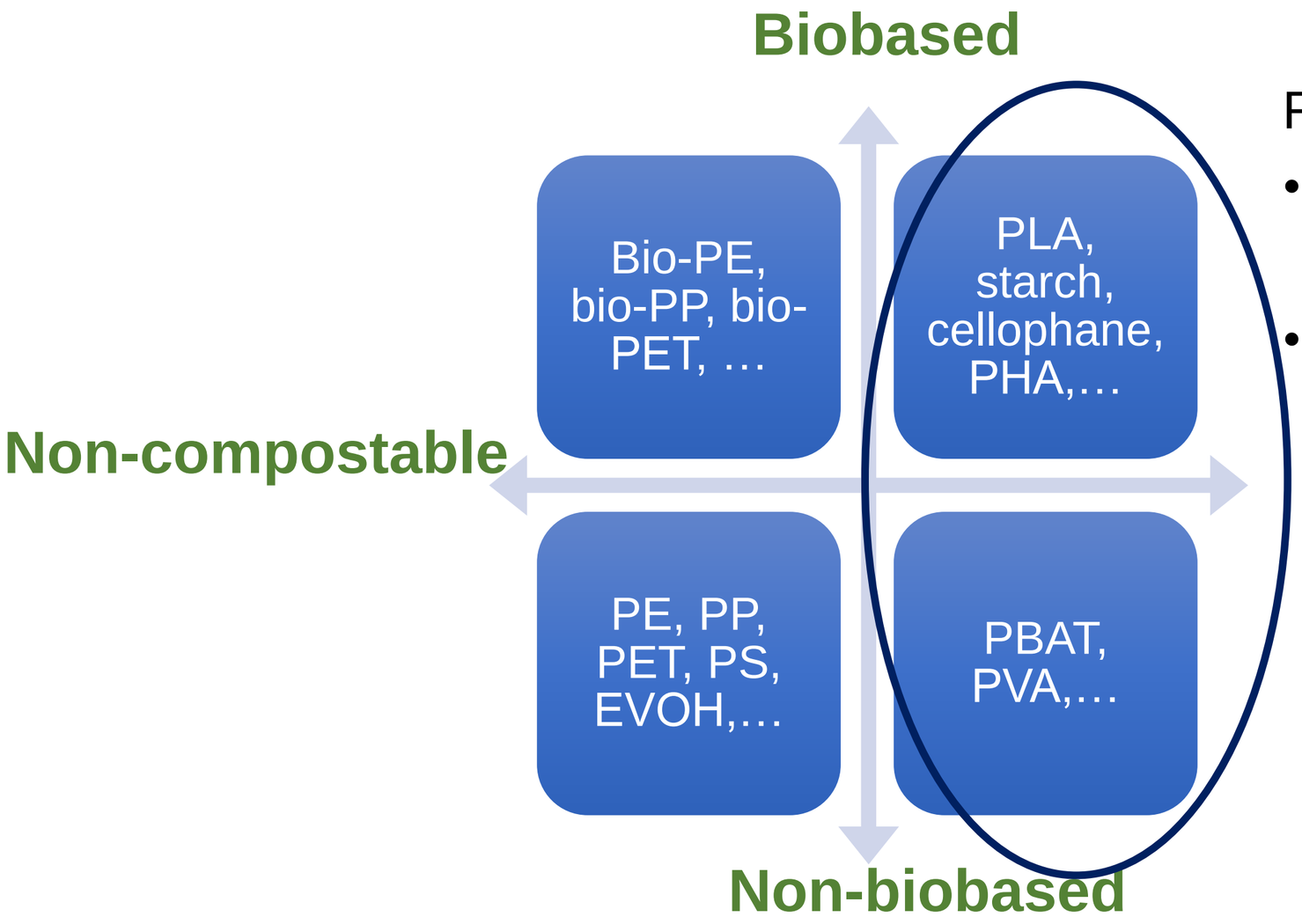
PROJECTS ON BIOPLASTICS IN FOOD PACKAGING



Adapted from University of Applied Science and Arts, Hannover, Germany

Research focussed on ‘new bioplastics’

- Applications for Modified Atmosphere Packaging (MAP)
- Applications for heat processes

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Use of biobased materials for modified atmosphere packaging of short and medium shelf-life food products

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ABSTRACT

The research objective was to evaluate the performance of biobased plastics for modified atmosphere packaging (MAP) both on laboratory and industrial scales. Therefore the shelf-life (4 °C) of rumpsteak, ham sausage, filet de saxe, grated cheese and pre-fried fries that were MAP-packed in poly(lactic acid) (PLA) and cellulose-based multilayer packages was evaluated and compared with their shelf-life when packed in conventional materials. Furthermore, tests were performed on industrial packaging lines.

http://dx.doi.org/10.1016/j.ifset.2014.06.007

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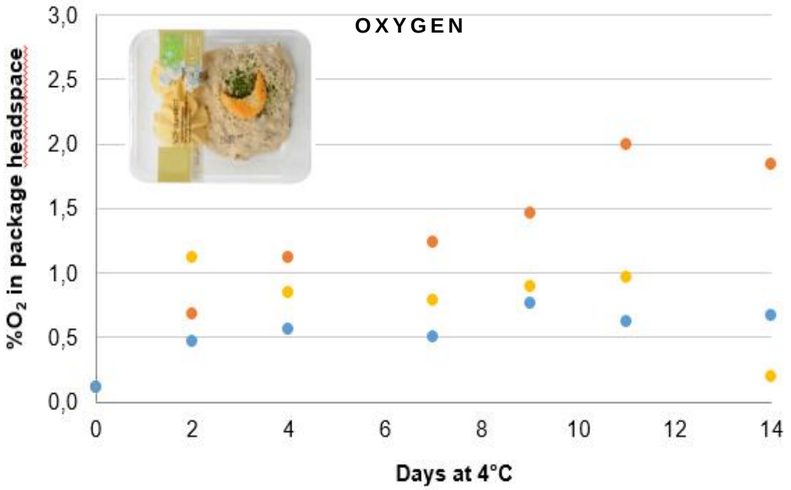
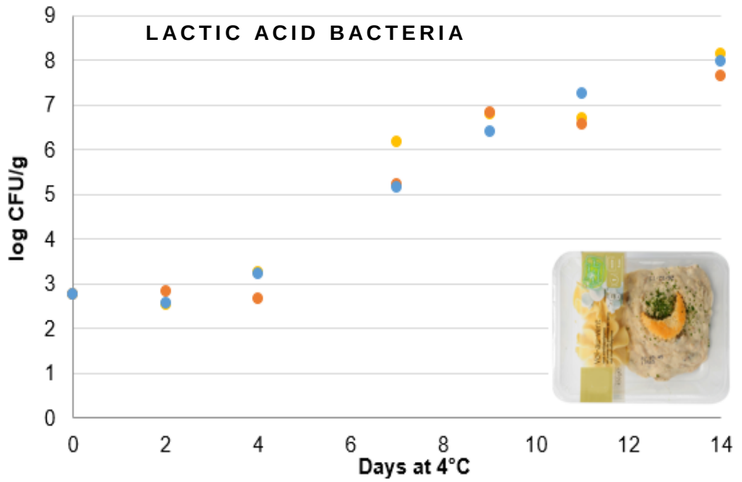
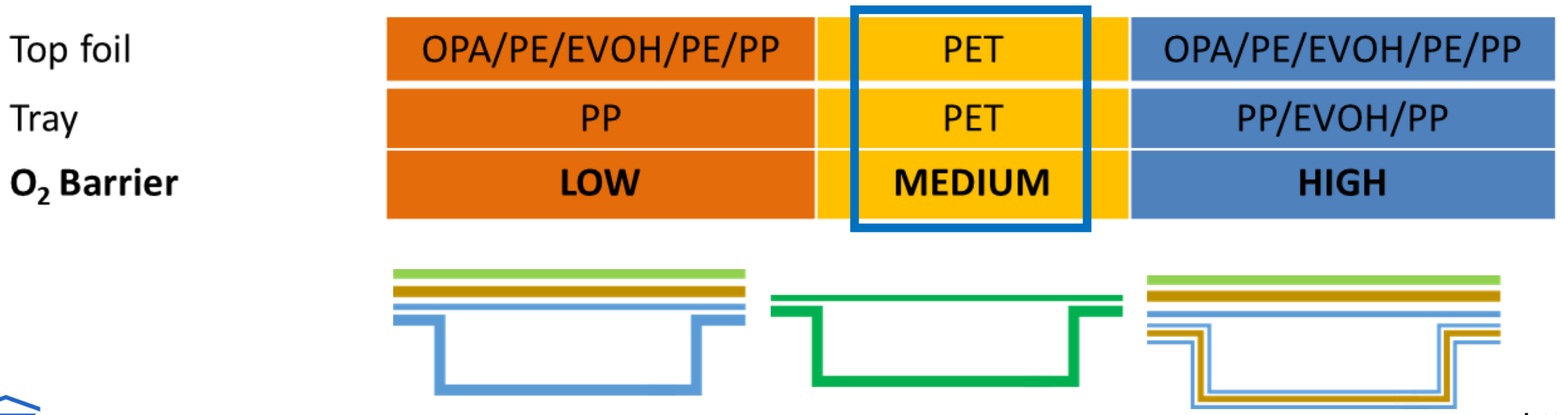
OPTIBARRIER: OPTIMIZING PACKAGING CONFIGURATION

STORAGE IN DARK CONDITIONS







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RESEARCH ARTICLE

Packaging Technology and Science | WILEY

Effect of packaging oxygen transmission rate on the shelf life of ready-to-heat foods susceptible to postcontamination during refrigerated and illuminated storage

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Peter Ragaert, Research Group Food

Since more and more pressure is exerted to reduce the use of plastic packaging materials, optimizing the use of food packaging is opportune. The aim of this study was to evaluate the combined effect of packaging materials, spanning a range of oxygen transmission rates (OTR), and retail illumination, on the microbial shelf life and safety of refrigerated ready-to-heat foods. Cooked potato slices were packaged in OPA/PP bags with a high OTR (28.85 $ccO_2/m^2/d$) and OPA-EVOH/PP bags with a low OTR (6.57 $ccO_2/m^2/d$). Cooked composite meals were packaged in tray and foil combinations, also spanning a range of OTR: PP trays (2.09 $ccO_2/tray/d$) with OPA/PP foils (28.85 $ccO_2/m^2/d$), PP trays with OPA-EVOH/PP (6.57 $ccO_2/m^2/d$) foils, and PET trays (0.07 $ccO_2/tray/d$) with PET top foil (32.86 $ccO_2/m^2/d$) . The packages were stored in a dark environment, or under fluorescent or LED light. Due to the rapid growth of lactic acid bacteria, the microbial shelf life of both food products was largely unaffected by the type of barrier. Illumination at 1000 lux for 12 hours per day led to temperature differences significantly affecting microbial growth. Based on the results, it could be concluded that re-evaluating packaging material choices for

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