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Inventing **Circularity** , Together

Hydrocracking technologies and the potential of the technology for
circularity

23/09/2021

Felix D. Bobbink, felix.bobbink@plastogaz.com



A founding team with strong technical experience in catalysis and sustainable chemistry



Dr. Felix D. Bobbink

Co-founder & CEO

- PhD in catalysis for CO₂ valorization from the Ecole Polytechnique Fédérale de Lausanne
- Over 30 scientific publications
- Inventor of the process



Prof. Paul J. Dyson (EPFL)

Scientific Advisor

- Dean of EPFL School of Basic Sciences
- Inventor of the process



Dr. Antoine van Muyden

Co-founder & CTO

- PhD in catalysis for biomass valorization from the Ecole Polytechnique Fédérale de Lausanne
- Over 15 scientific publications
- Inventor of the process



Wei-Tse Lee

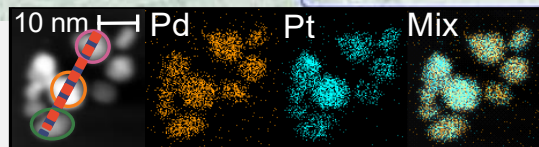
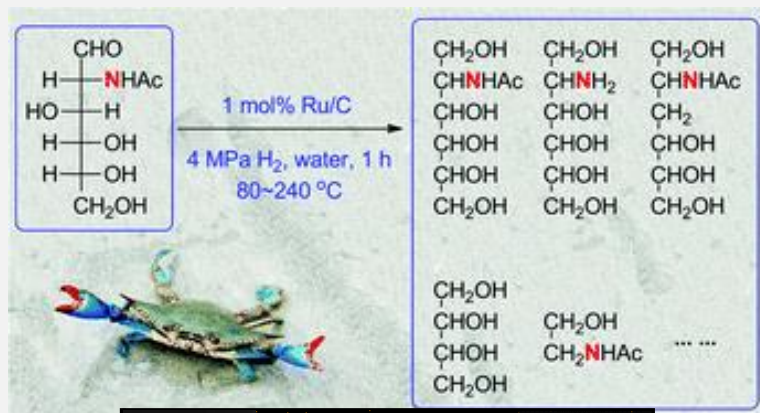
Co-founder & engineer

- PhD candidate from the EPFL in catalysis for polymer valorization
- Catalysis design for the transformation of plastic waste into value-added products
- Inventor of the process

plastogaz Is an **EPFL** Spin-off company

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The background science by the founders:



Original research & Reviews on the topics of:

- Biomass to chemicals
- CO₂ to chemicals and polymers (incl. polyurethanes)
- Plastic to value added products

F. D. Bobbink, J. Zhang, Y. Pierson, X. Chen and N. Yan, *Green Chem.*, 2015, **17**, 1024–1031.;

F. D. Bobbink, A. P. Van Muyden and P. J. Dyson, *Chem. Commun.*, 2019, **55**, 1360–1373;

S. B. C. Verstraeten, A. Van Muyden and F. D. Bobbink, *Chimia*, 2021, **75**, 744–751.

W. T. Lee, A. P. van Muyden, F. D. Bobbink, Z. Huang and P. J. Dyson, *Angew. Chemie - Int. Ed.*, 2019, **58**, 557–560.

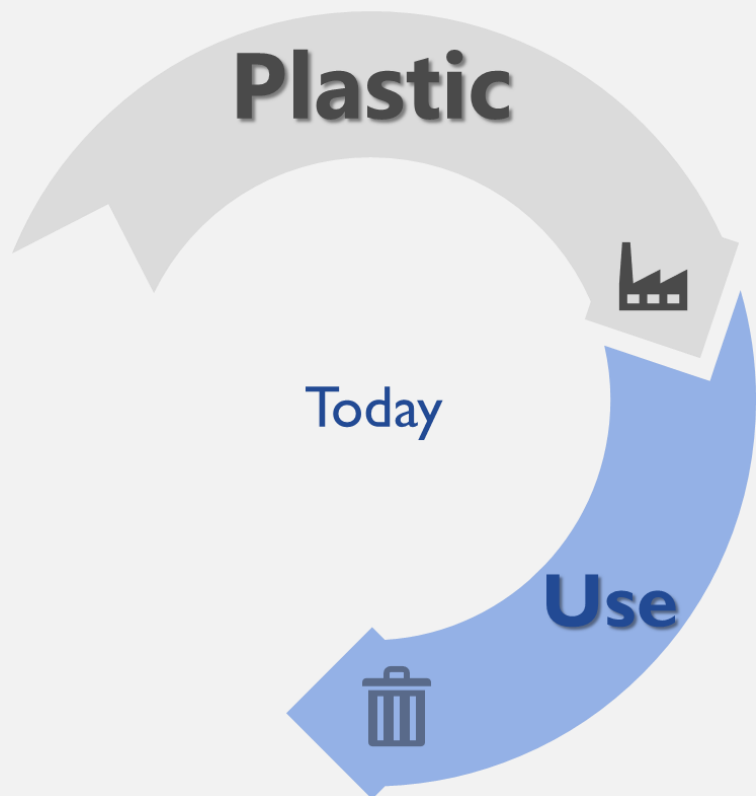
W. T. Lee, F. D. Bobbink, A. P. van Muyden, K. H. Lin, C. Corminboeuf, R. R. Zamani and P. J. Dyson, *Cell Reports Phys. Sci.*, ,

DOI:10.1016/j.xcrp.2021.100332.

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The market information further convinced us to develop hydrocracking technologies

30 bn\$ market potential
for **CHEMICAL RECYCLING**
by **2030!**

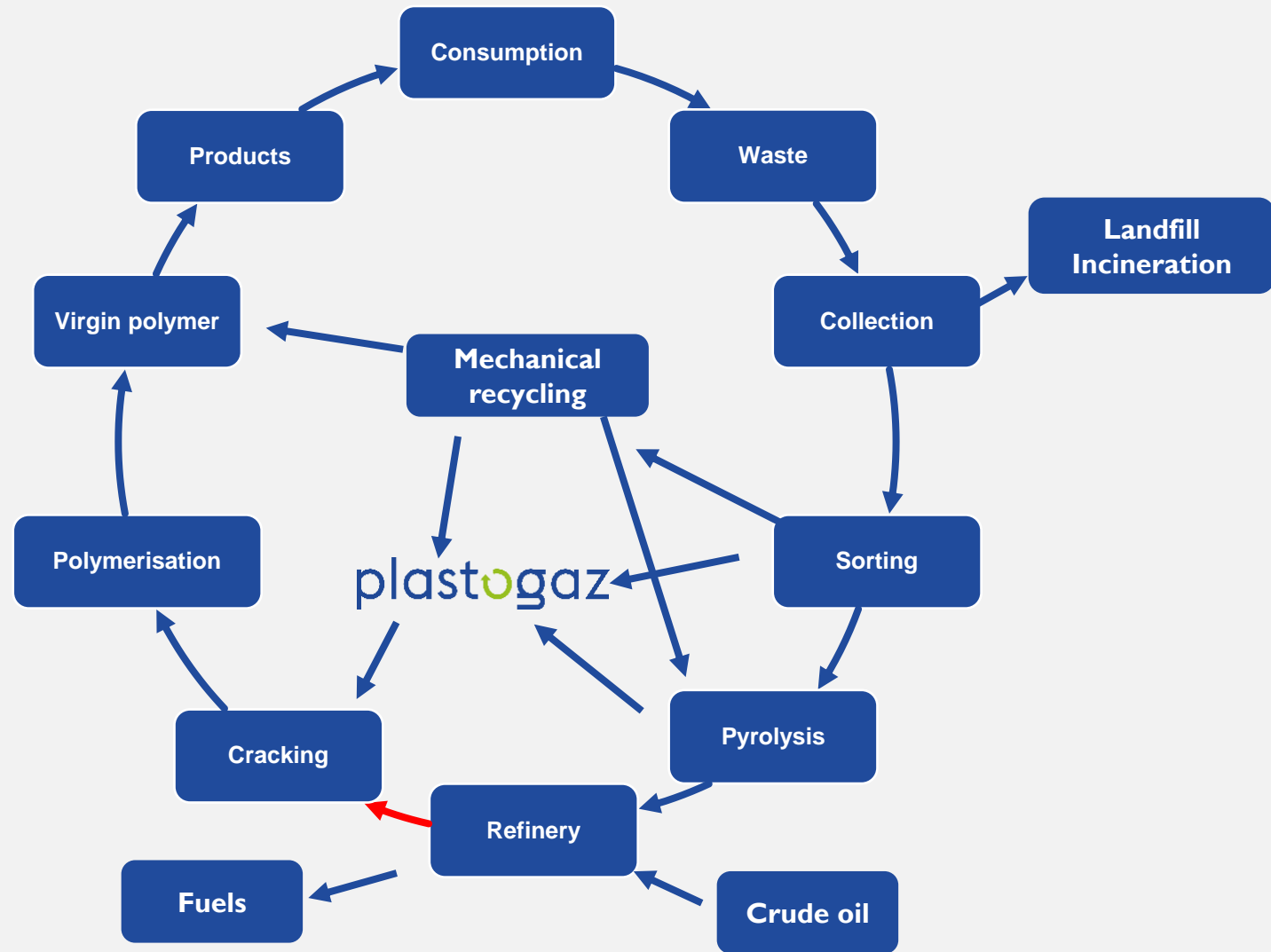


*circularity means that plastic will be used over and over again, which is not possible today with current technologies.

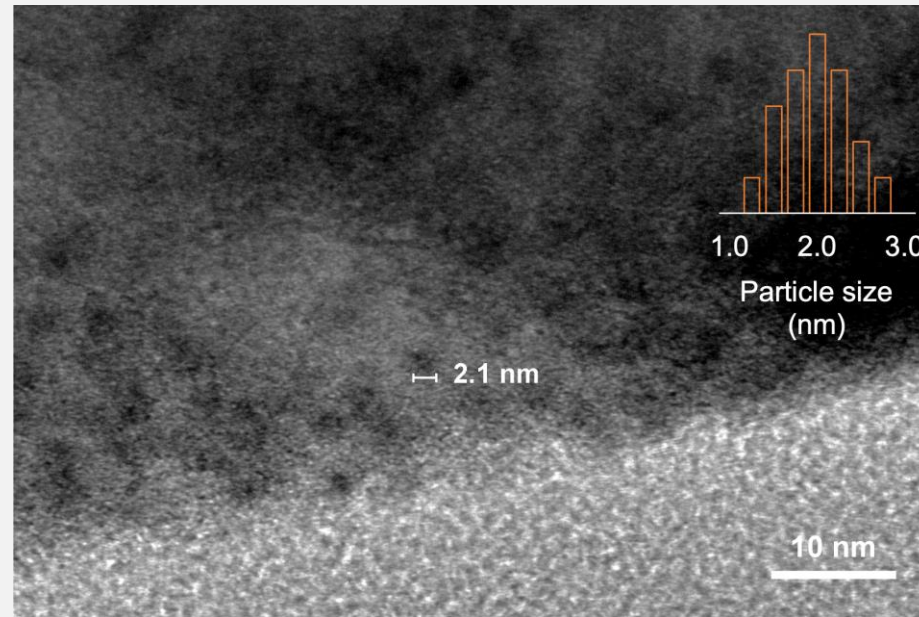
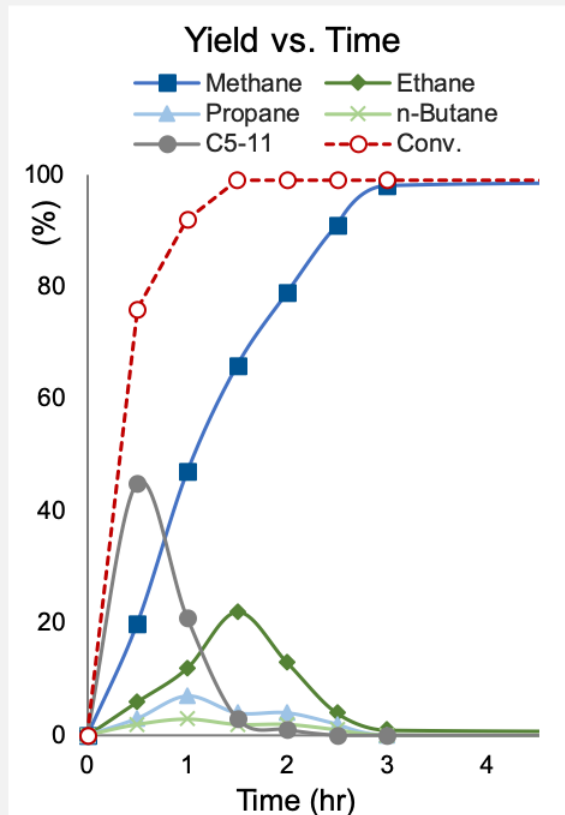
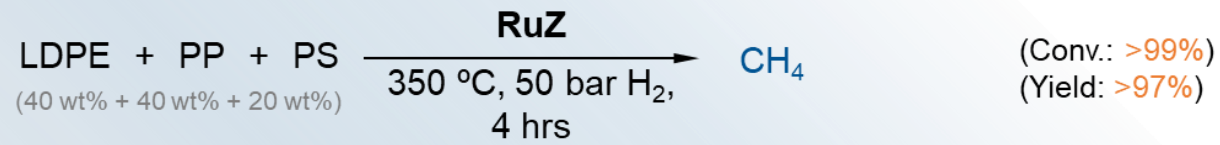


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The transition to a circular economy must encompass all stakeholders

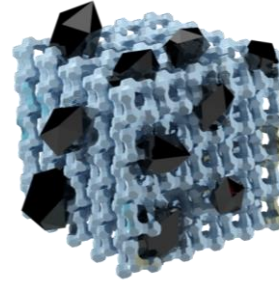


The science behind hydrocracking (1):

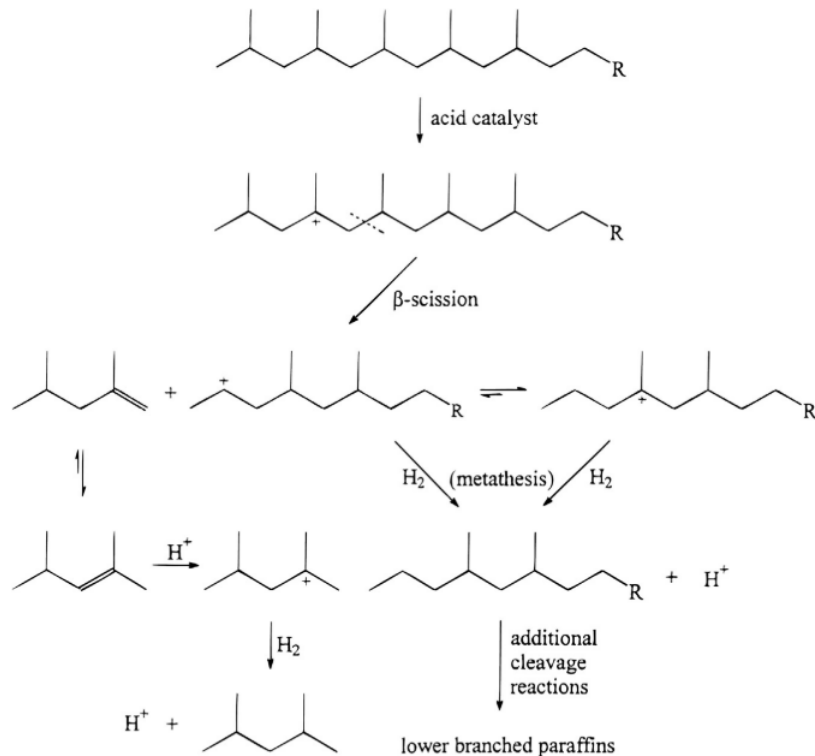


***RuZ** = Ru composite zeolite catalyst

The science behind hydrocracking (2):



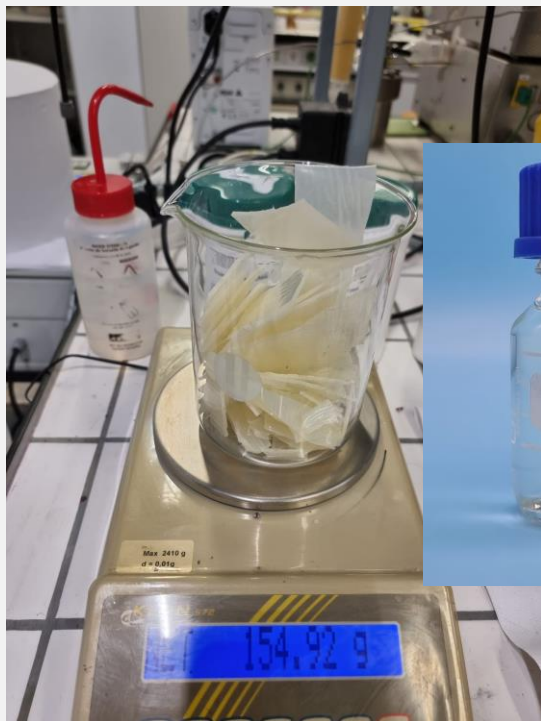
Our catalyst **improves** selectivity, avoids coke formation, and decreases the reaction temperature by 40 % compared to pyrolysis !



The catalyst helps breaking C-C bonds and hydrogenation of C=C bonds

Source: D. Munir, M. F. Irfan and M. R. Usman, *Renew. Sustain. Energy Rev.*, 2018, **90**, 490–515.

The scale-up journey started in 2019



2019: 1-gram scale reaction

2020-2021: 100 gram-scale reaction

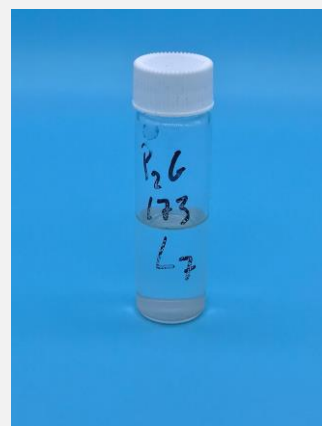
2022: 10 kg scale reaction, pilot

Evaluated feedstocks:

- Post-consumer shampoo bottles (HDPE)
- Post-consumer flexible films (bulk PE, additives and impurities)

Evaluation of specific use-cases:

- Tapes
- Consumer good products



The product, Naphtha, is suitable for plastic production!

What insights hydrocracking give for tapes



Glue compatible with the process



Challenging glues



Pre-processing required

The composition of the glues and additives used influences the process efficiency, potentially aiding in redesigning tapes towards chemical recycling



Our mission is to invent sustainable chemistry for the future, today.
We commit to deliver our innovative and valuable solutions by collaborating with like-minded organizations.

Plastogaz develops an award-winning technology

Partners & Media

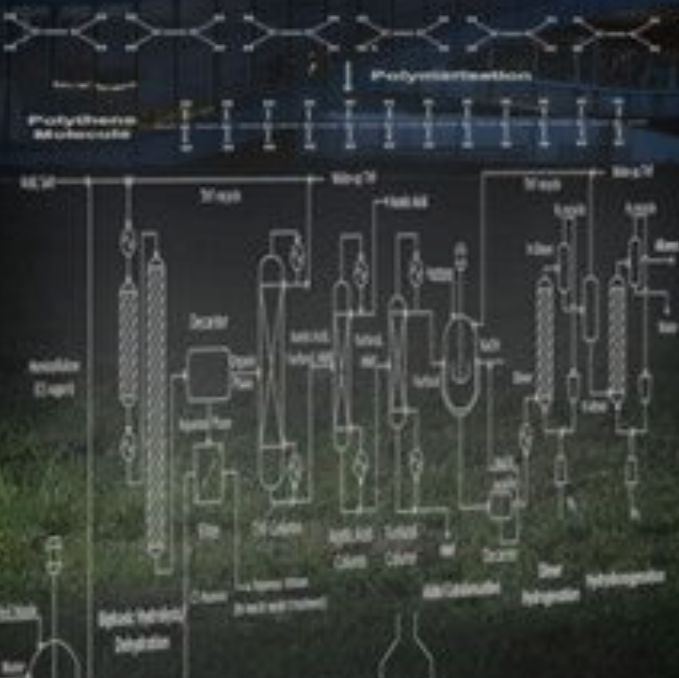
Advocates and supporters

The image displays a collection of logos for various organizations that support or advocate for Plastogaz. The logos are arranged in a grid-like fashion. At the top, a dark blue banner contains the text "Advocates and supporters". Below this, the logos include: EPFL (red and black text); Wissenschaft.Bewegen (black text with "GEBERT RUF STIFTUNG" below); Venture Kick (black and red text with a grid of dots); Switzerland Innovation (red and white cross logo with "SWITZERLAND INNOVATION" text); Innosuisse - Swiss Innovation Agency (Swiss cross logo with text in German, French, Italian, and English); IMD (blue and white logo with "REAL LEARNING. REAL IMPACT" tagline); Office for Economic Affairs and Innovation (SPEI) (green and white logo with "canton de Vaud" text); FIT (green cross logo with "fondation pour l'innovation technologique" text); eit Climate-KIC (blue and green circular logo); Top 100 Swiss Startup Award (gold laurel wreath logo with "TOP 100" text); MC MassChallenge (blue and green logo); and Bilan (white text on a red background).

The image is a yellow poster for the "Bilan" award. At the top right, the word "Bilan" is written in white on a red rectangular background. Below it, the word "INVESTIR" is written in red. The main title "SÉLECTION DES MEILLEURES STARTUPS SUISSES" is written in large, bold, black capital letters. At the bottom, a paragraph of text reads: "Le jury de Bilan a sélectionné 31 jeunes pousses innovantes à la recherche de fonds. Elles sont principalement actives dans les technologies médicales, mais proposent aussi des solutions en matière environnementale ou de services."

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