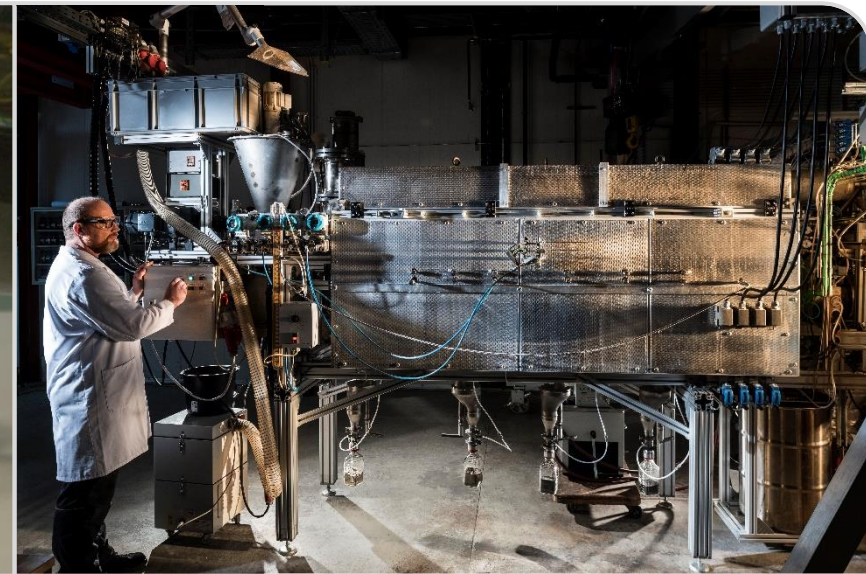


Towards Polyurethane Circularity

Lab-scale Investigations & Detailed Product Analyses

KNT Symposium 2024 - Karlsruhe

M. Zeller, L. Weigel, A. Hannemann, P. Shrestha, A. Erdenepurev, L. Wattenberg, D. Merz, S. Tavakkol, D. Stapf



Why are Polyurethanes not circular already?



Rigid Polyurethane
Foam (RPUF)



Flexible Polyurethane
Foam (FPUF)



Cast Elastomer (CE)

- Coatings
- Adhesives
- Thermoplastic PUR
- ...

many more...



Mechanical Recycling

- Thermoset properties
- Variety of PUR
- Additives
- Downcycling



Chemical Recycling - Solvolysis

- PUR type-dependent processes
- Additives
- Product Yield

Can Pyrolysis make PUR circular?

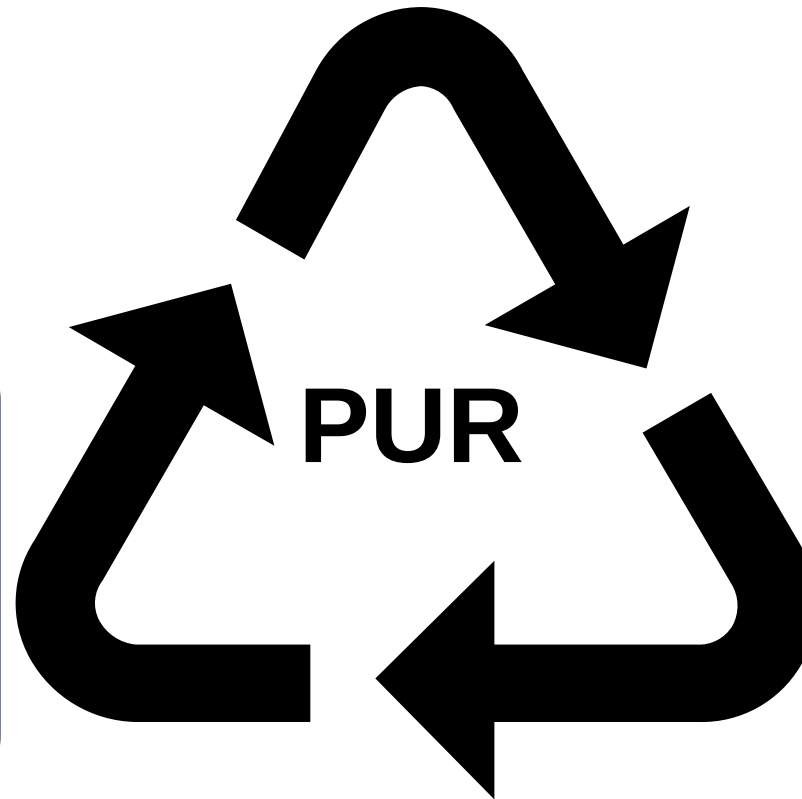
Can Pyrolysis make Polyurethane circular?

Yields 

Small Scale: Thermogravimetry

Lab Scale: PURPUR Batch Pyrolyzer

Pilot Scale: STYX Screw Reactor

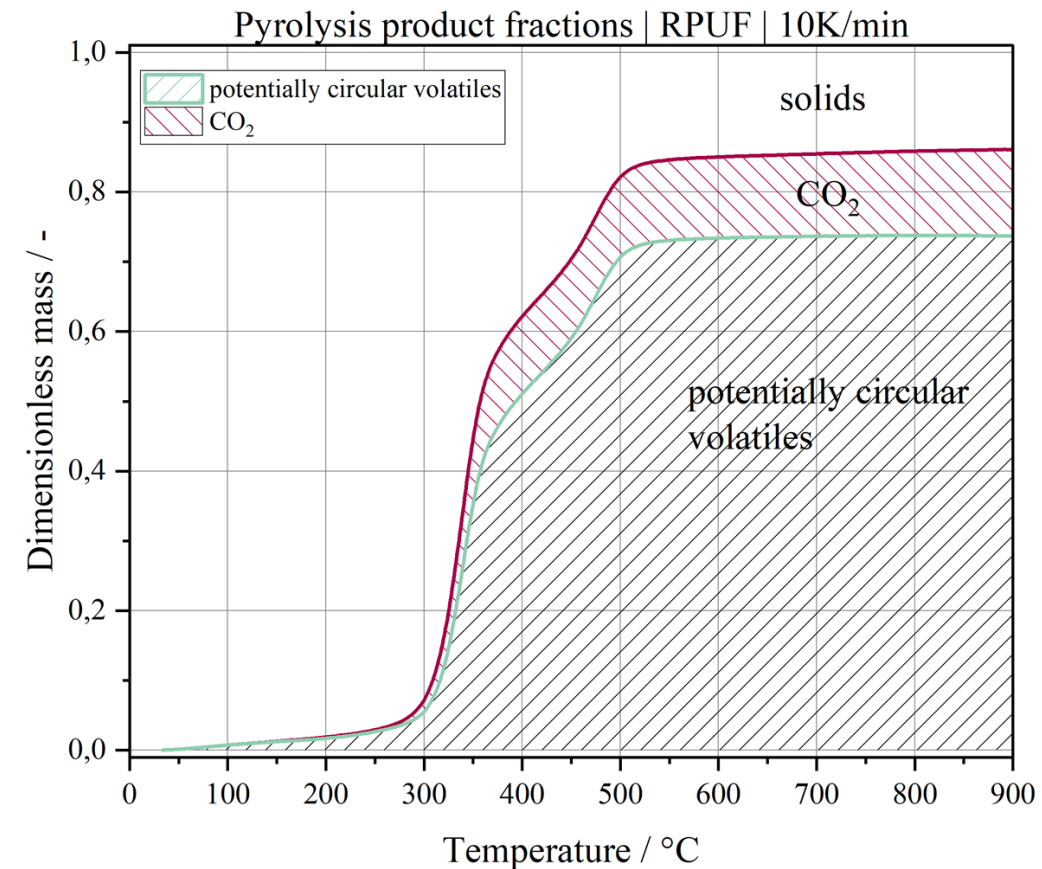


Products 

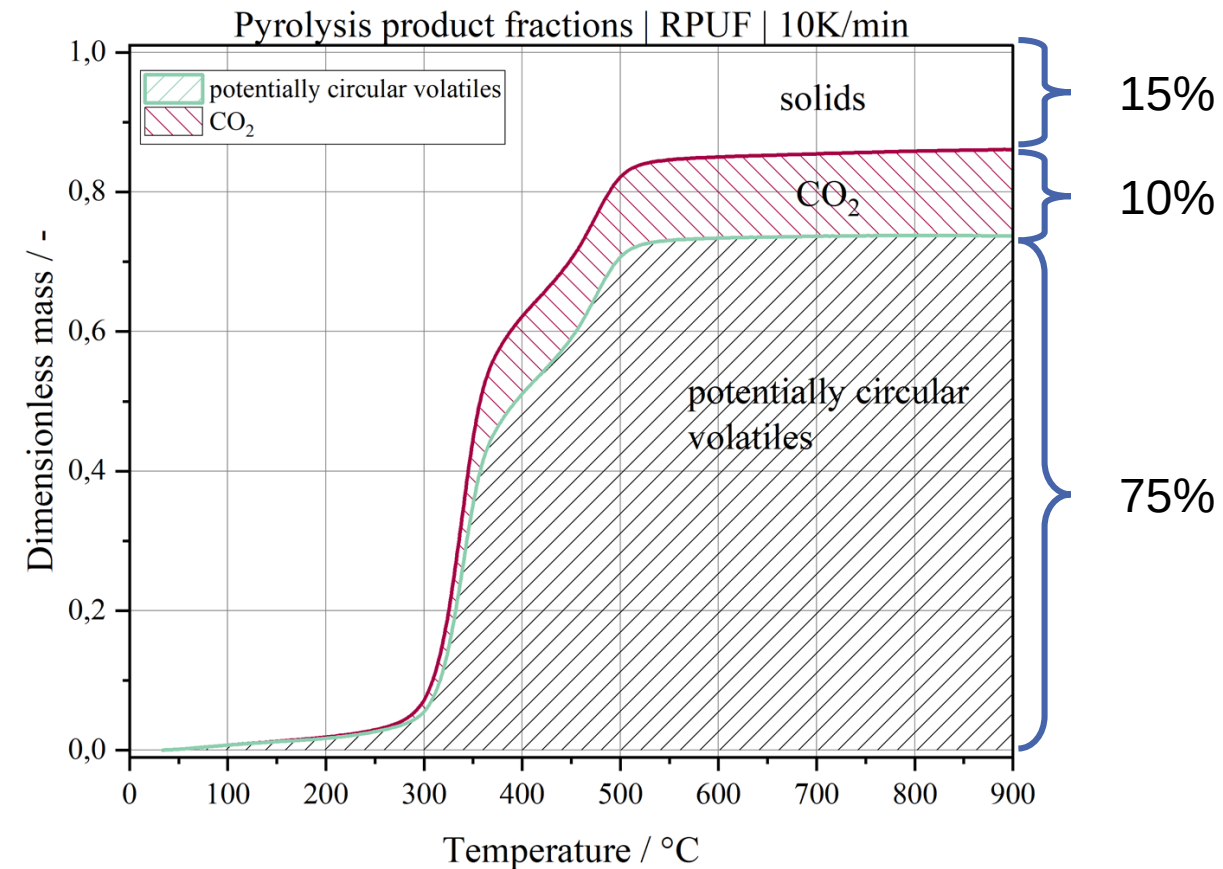
Next Talk: N. Netsch
Advanced analytical
methods for
characterization of
condensable pyrolysis
products from plastic
waste



Thermogravimetry



Thermogravimetry



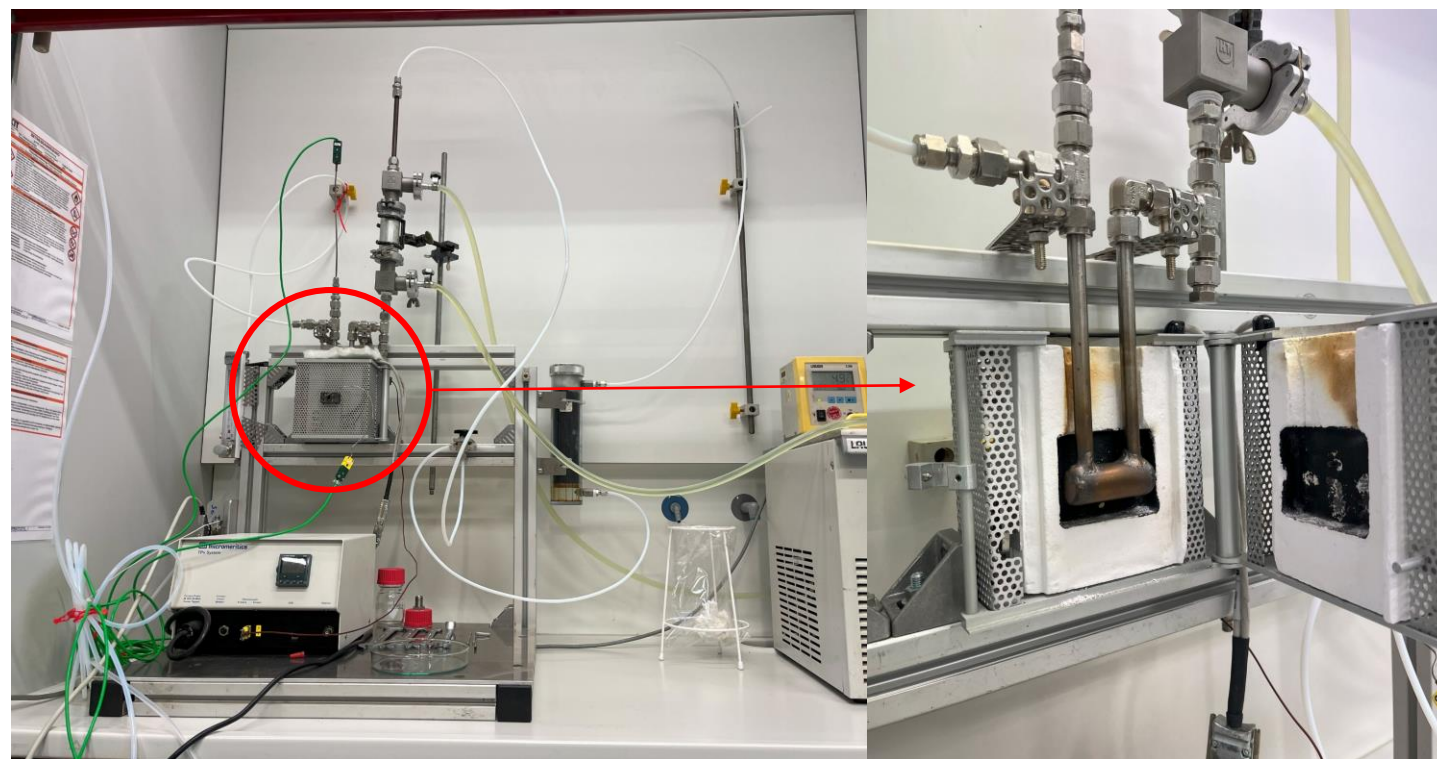
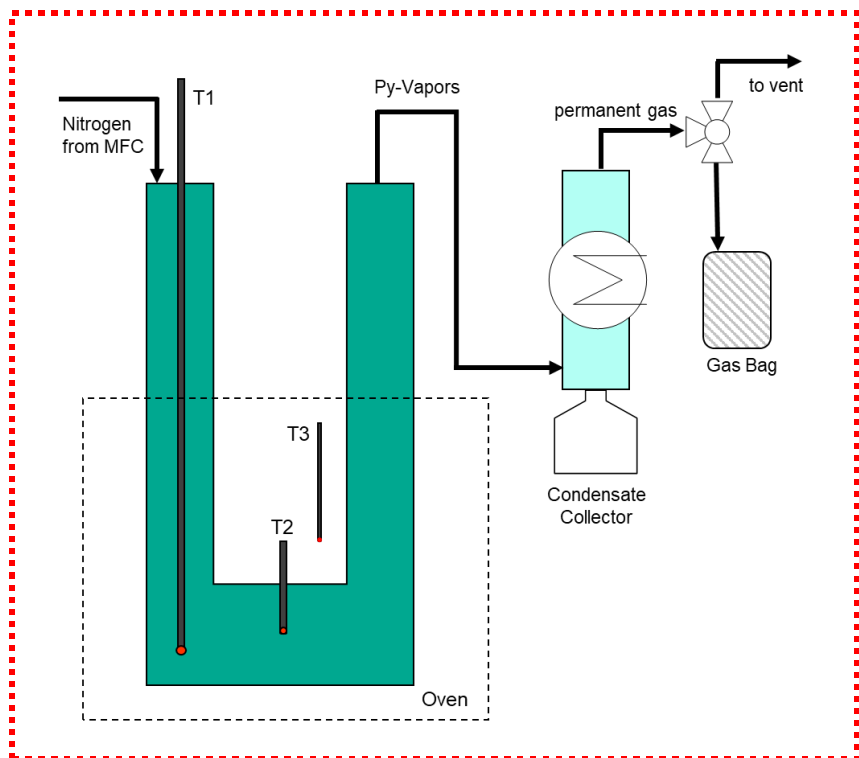
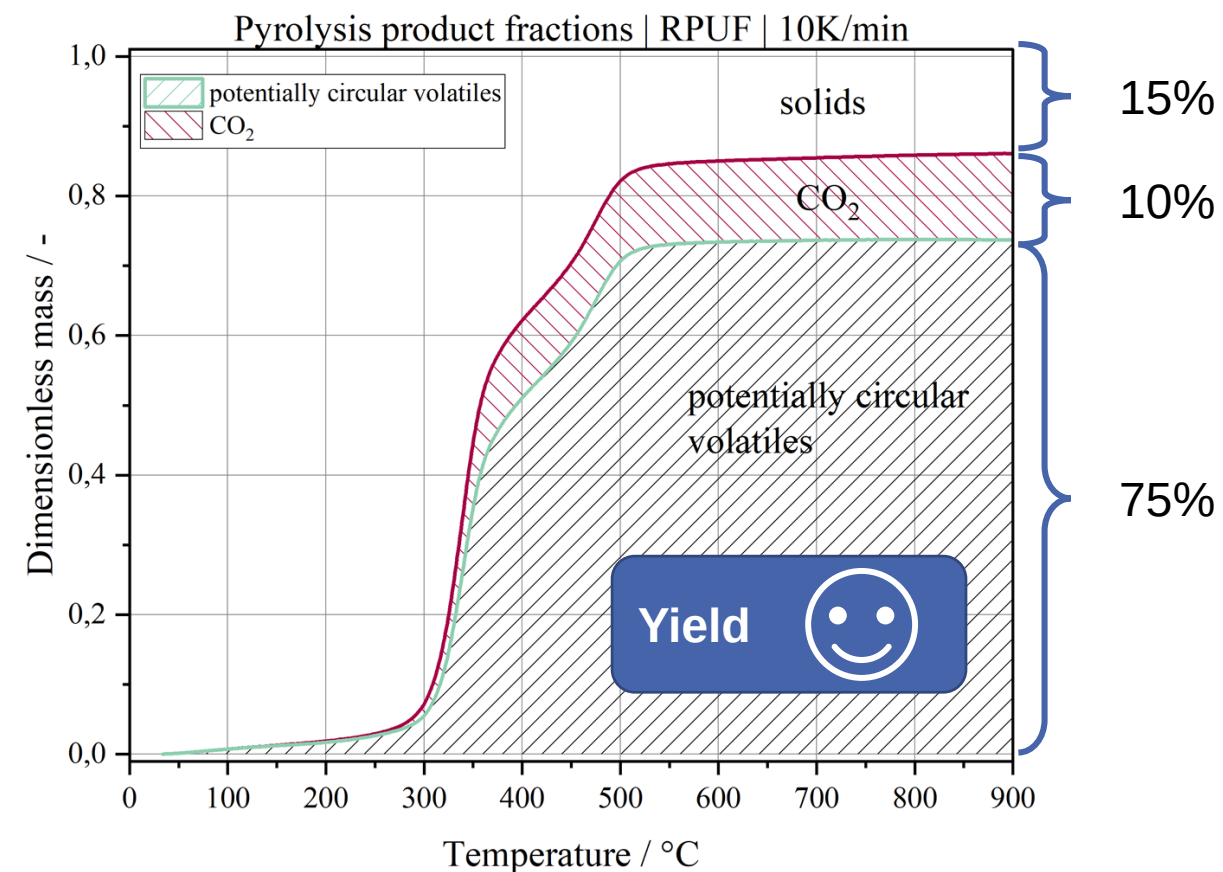
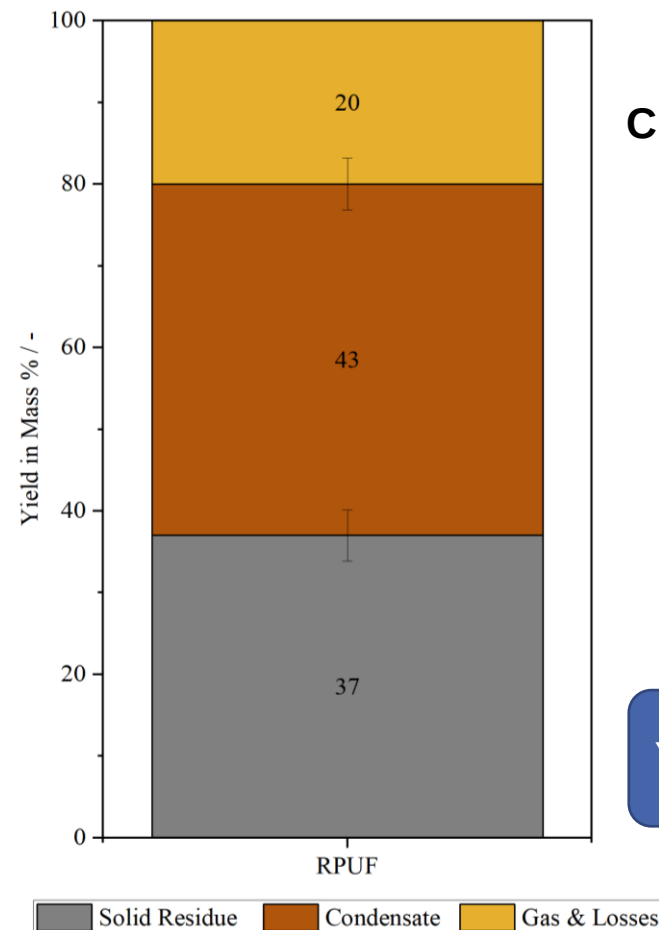


Figure: Pyrolysis Experimental Set-up

Thermogravimetry



Lab-scale Pyrolysis @ 450 °C

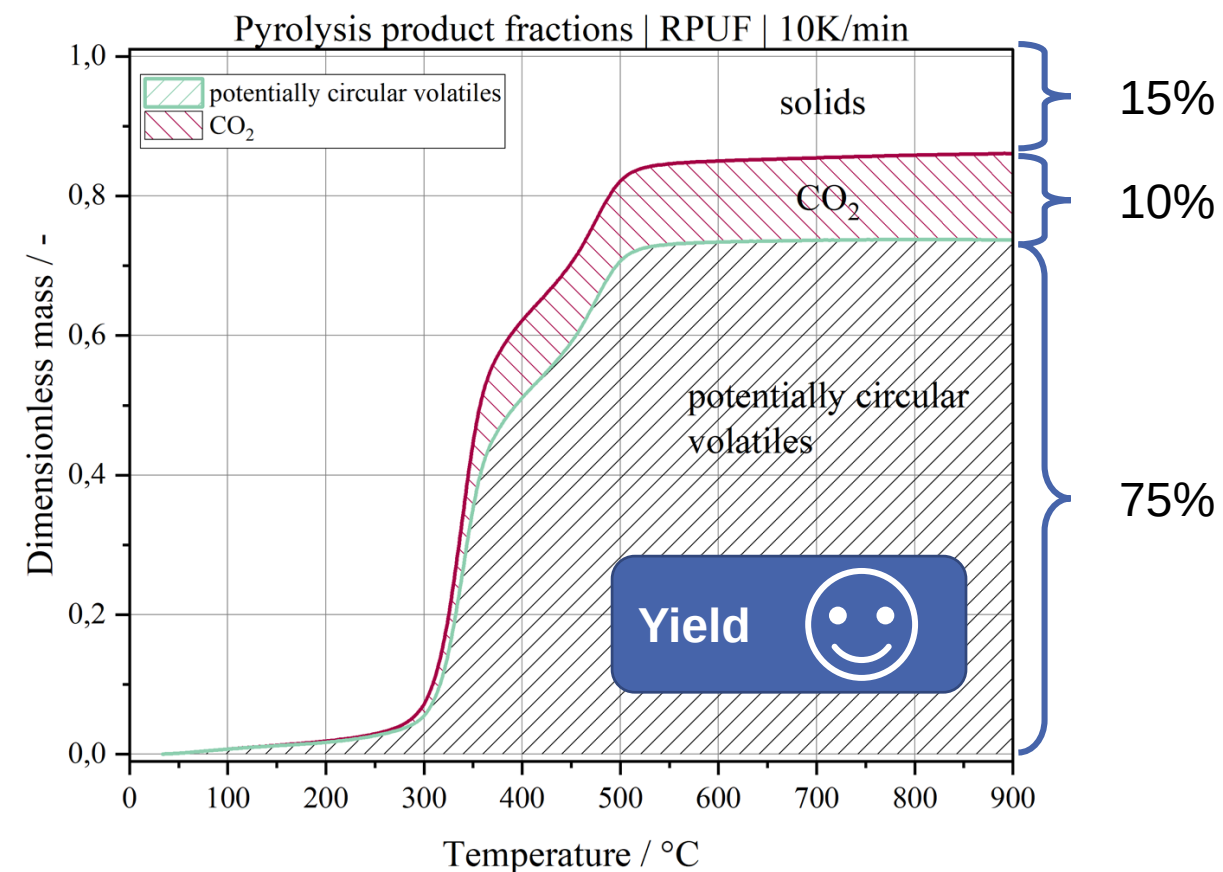


Current research:

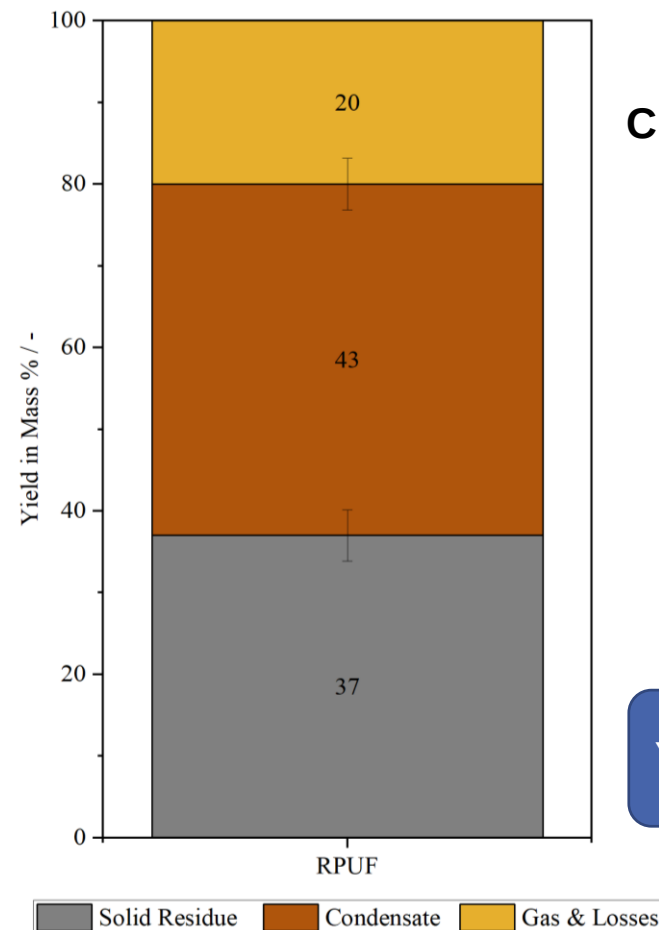
- Reaction Temperatures
- Temperature Profiles
- Residence Times
- Reactor Technologies

Yield 😞

Thermogravimetry



Lab-scale Pyrolysis @ 450 °C

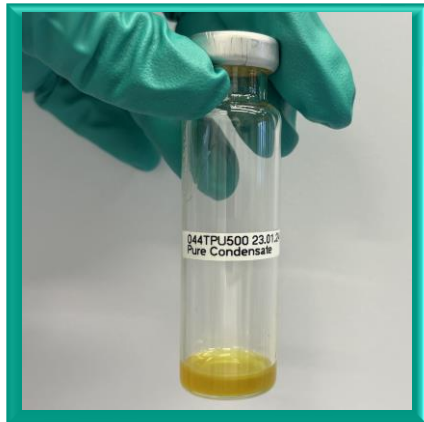


Current research:

- Reaction Temperatures
- Temperature Profiles
- Residence Times
- Reactor Technologies

Yield 😊

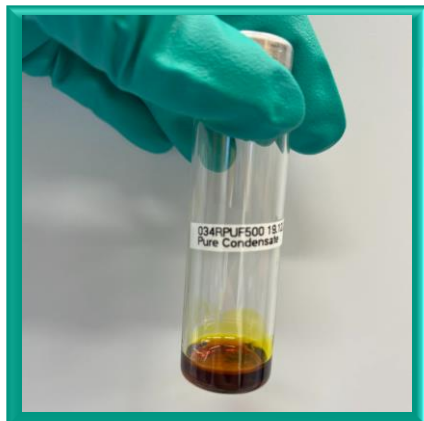
Thermoplastic PUR



Cast Elastomer



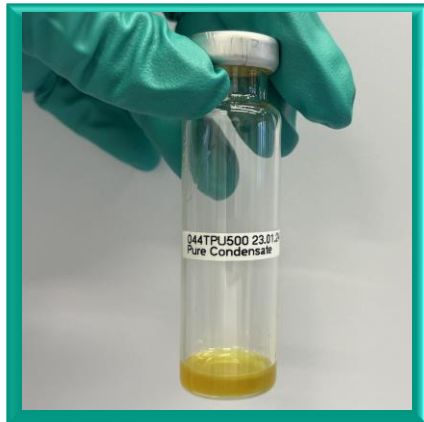
Rigid PUR Foam (RPUF)



Flexible PUR Foam



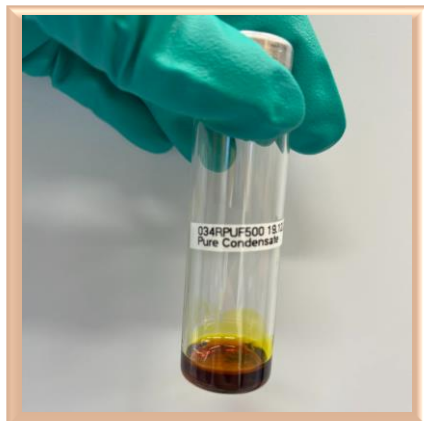
Thermoplastic PUR



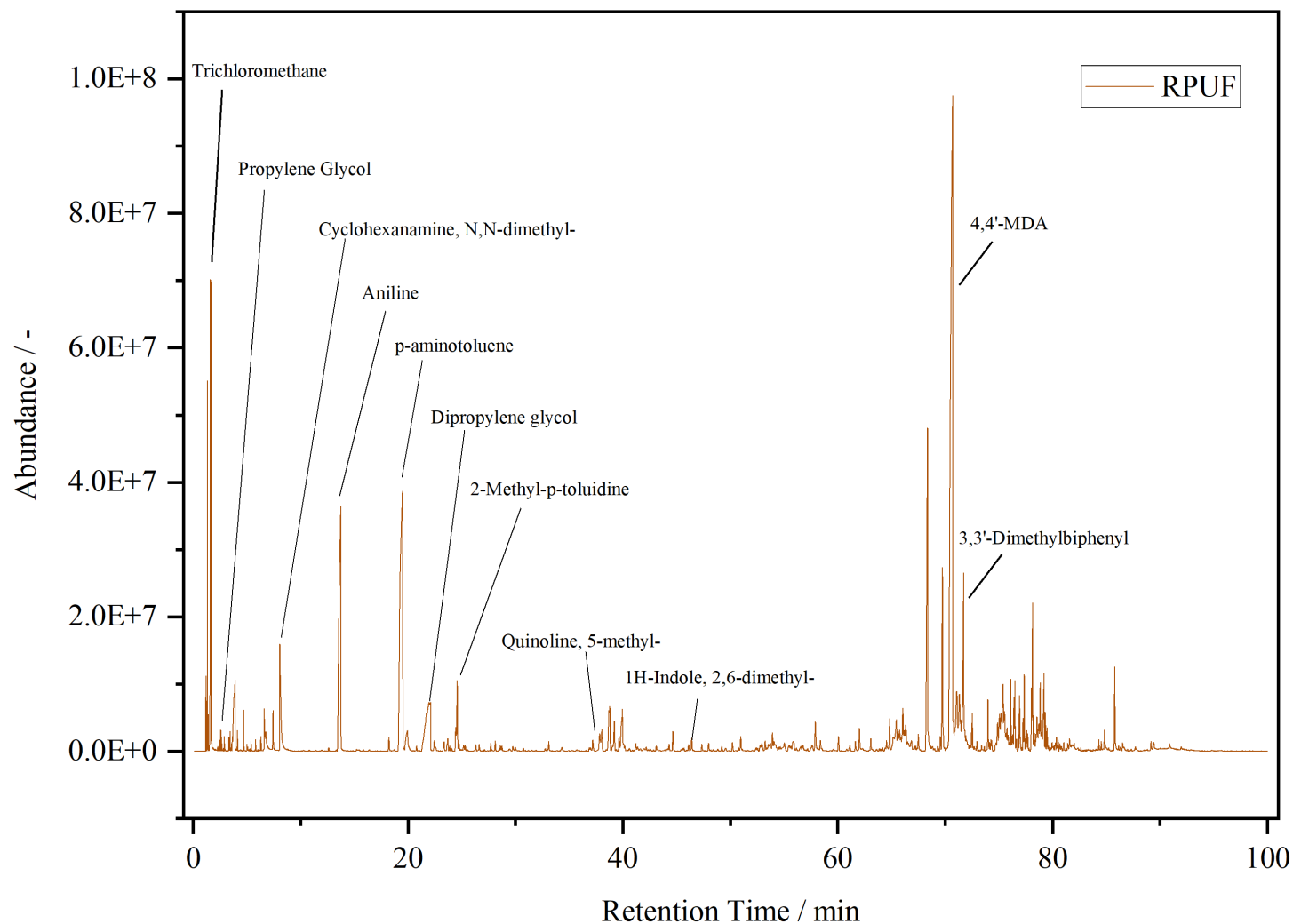
Cast Elastomer



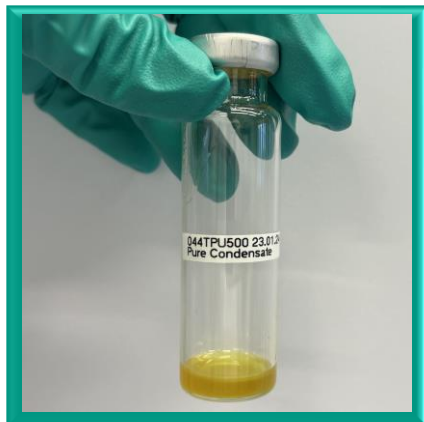
Rigid PUR Foam (RPUF)



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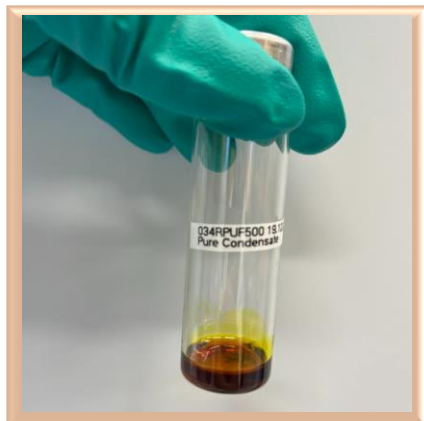
Thermoplastic PUR



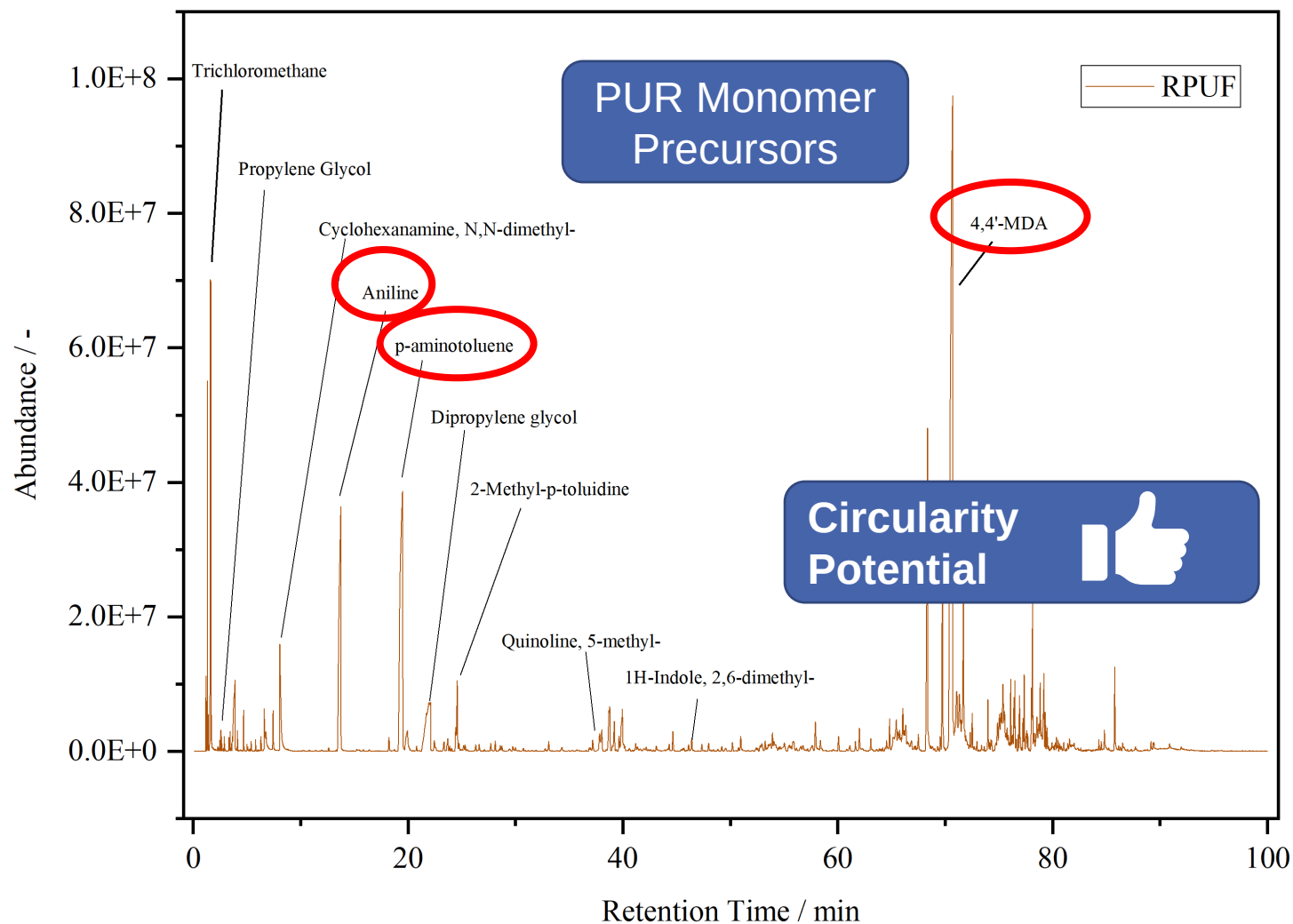
Cast Elastomer



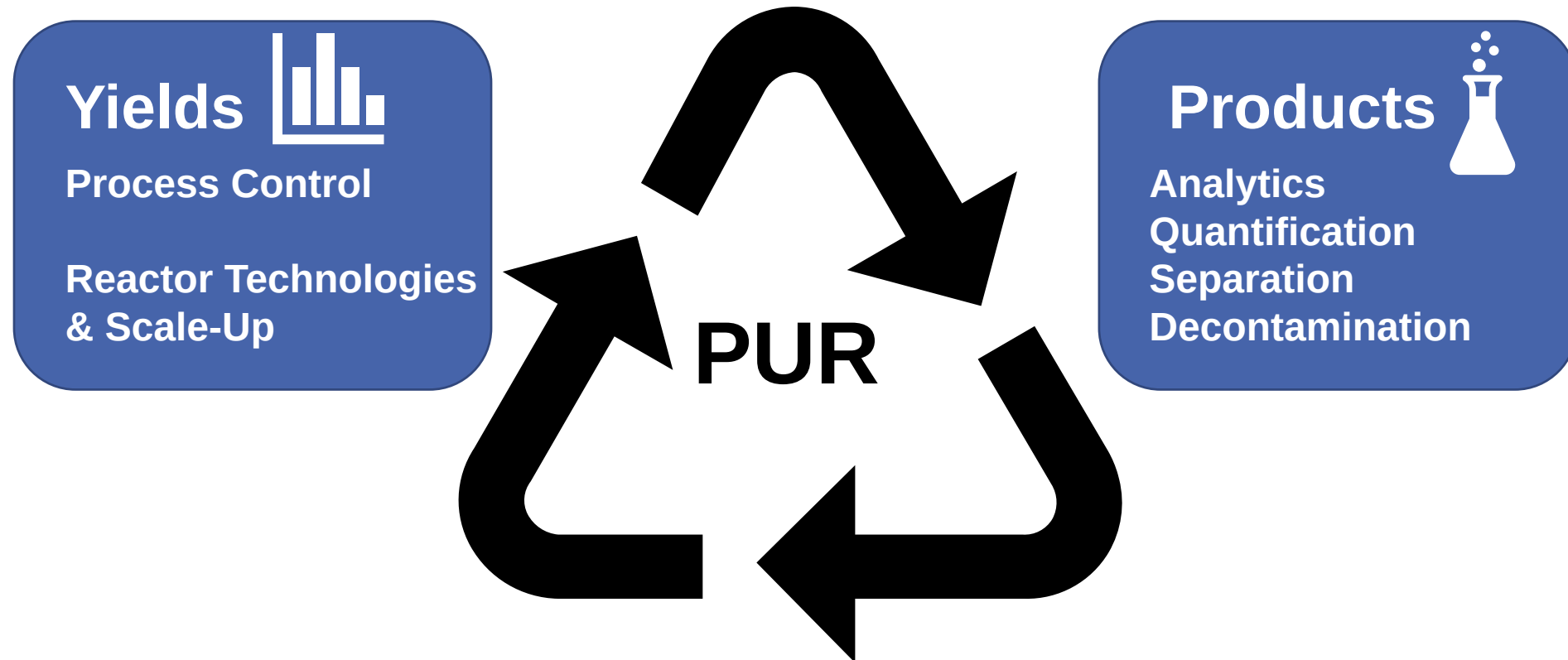
Rigid PUR Foam (RPUF)



Flexible PUR Foam



Can Pyrolysis make Polyurethane circular?



Can Pyrolysis make Polyurethane circular?

