



Herausforderungen und Konzepte zur chemischen Trennung und Wiedernutzung von synthetischen Fasern

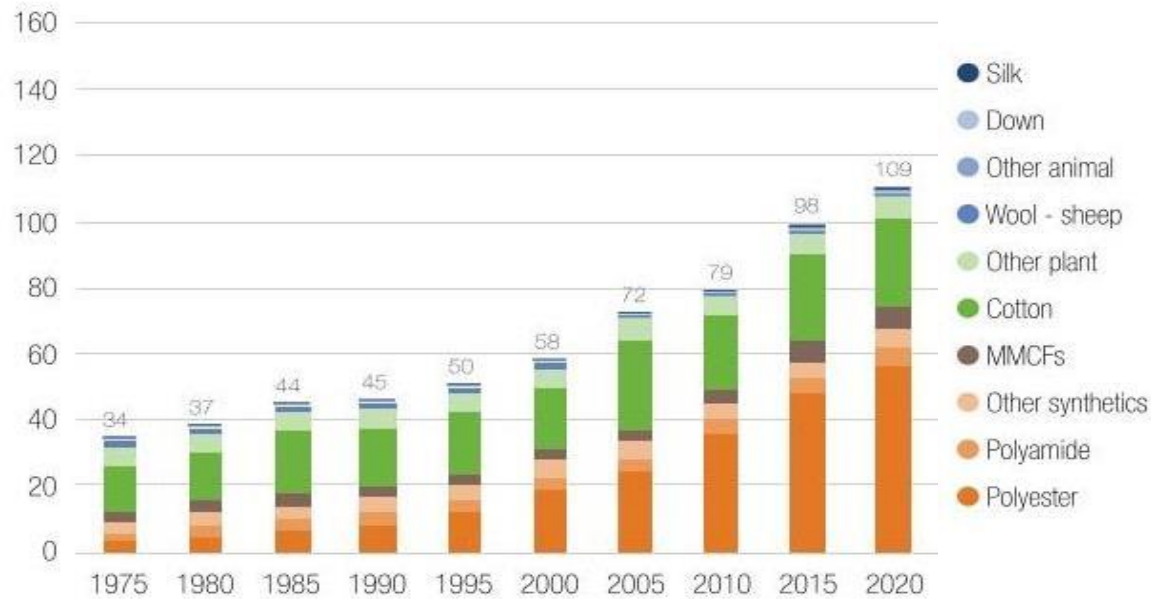
Tung Pham
Wien, 27.04.2023

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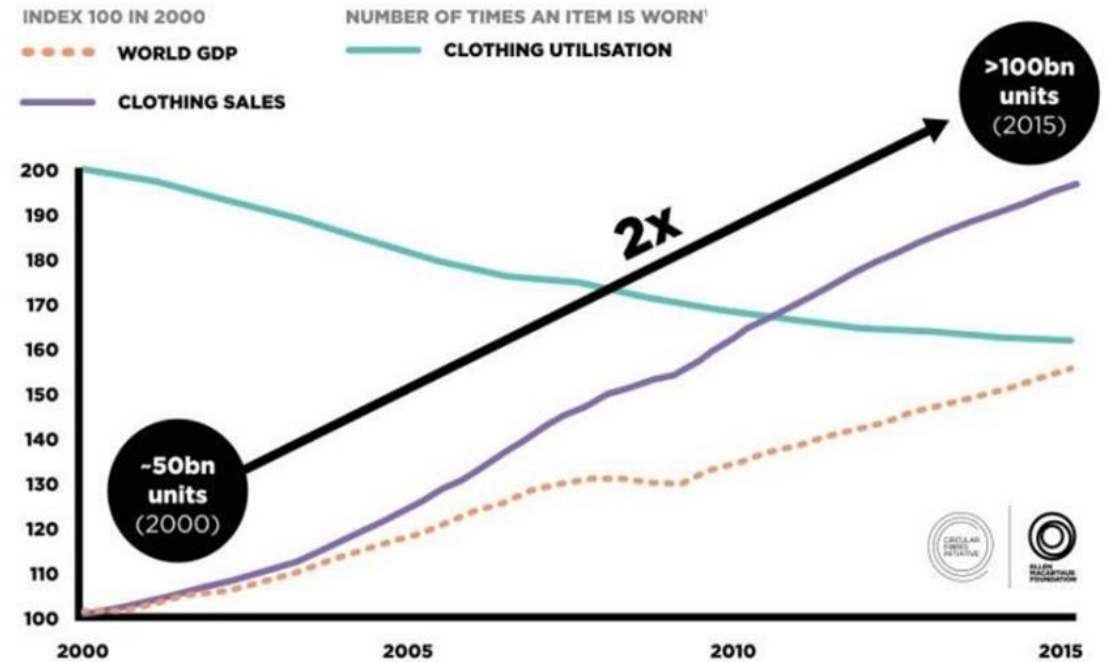
- Founded in 1982
- Part of Faculty of Chemistry and Pharmacy
- Located in Dornbirn
- 21 members as of April 2023
- 2 Full Professors, 1 Assistant Professor
- 7 (+2 extern) PhD students, 5 PostDocs
- Modern laboratories in textile chemistry and polymer materials
- Intensive industry collaboration
- Hosting COMET K Project Textile Competence Center Vorarlberg TCCV



Fibre production and clothing industry



Global fibre production in million tonnes [1]



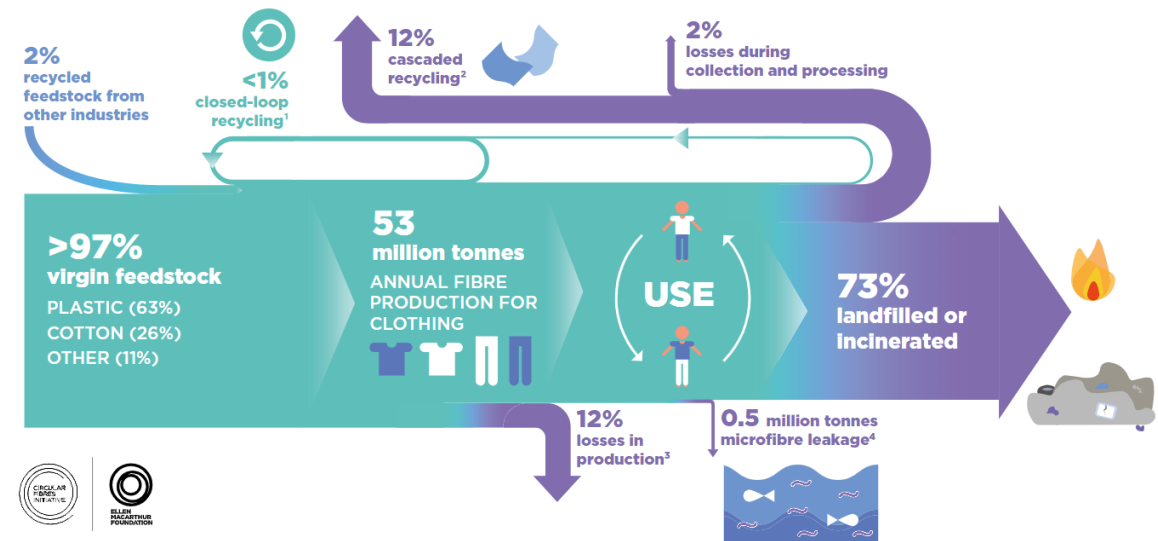
Average number of times a garment is worn [2]

[1] Preferred Fiber & Materials Market Report 2021, Textile Exchange
<https://textileexchange.org/preferred-fiber-and-materials-market-report/>

[2] Ellen MacArthur Foundation, A new textiles economy: Redesigning fashion's future tech. rep. (2017). <http://www.ellenmacarthurfoundation.org/publications>.

Challenges in the clothing industry

- Fast fashion
- Linear pathway for clothes
- Very complex material composition
 - mixture of fibres
 - dyes
 - additives etc.
- Mechanical sorting as state of the art
- No standard in material labelling



Global material flow for clothing in 2015 [2]



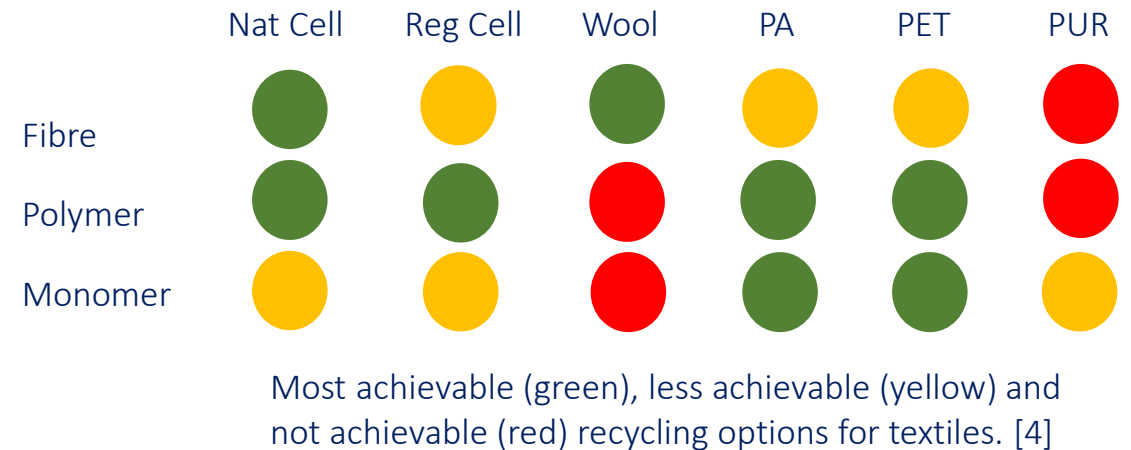
Chile's Atacama desert [3]

[2] Ellen MacArthur Foundation, A new textiles economy: Redesigning fashion's future tech. rep. (2017). <http://www.ellenmacarthurfoundation.org/publications>.

[3] Tiffany Duong. Chile's Atacama Desert: Where Fast Fashion Goes to Die - EcoWatch Dec. 2022. <https://www.ecowatch.com/chile-desert-fastfashion-2655551898.html>.

Challenges in the clothing industry

- No standard definition of textile recycling technologies
- Most techniques only suitable for mono material waste streams
- Mix components as contaminants in recycling processes

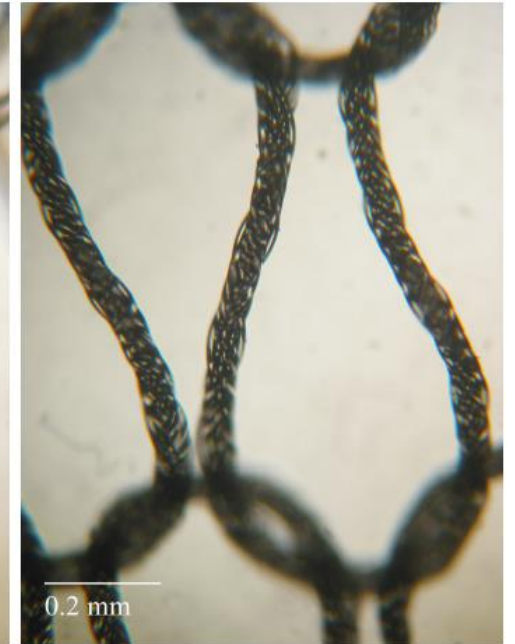
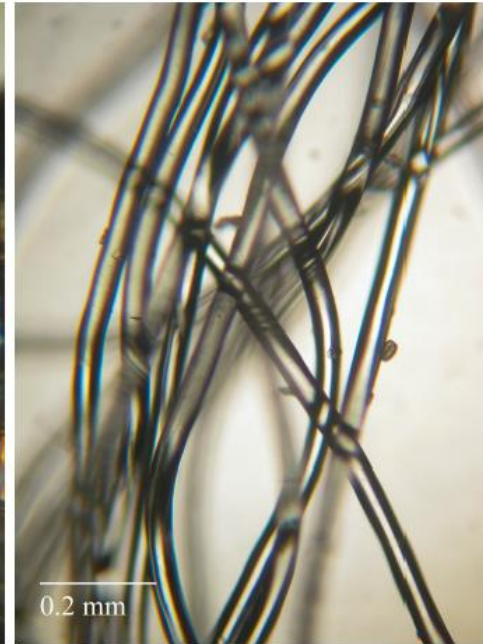


[4] Harmsen, P., Scheffer, M. & Bos, H. Textiles for circular fashion: The logic behind recycling options. Sustainability (Switzerland) 13. ISSN: 20711050 (Sept. 2021).

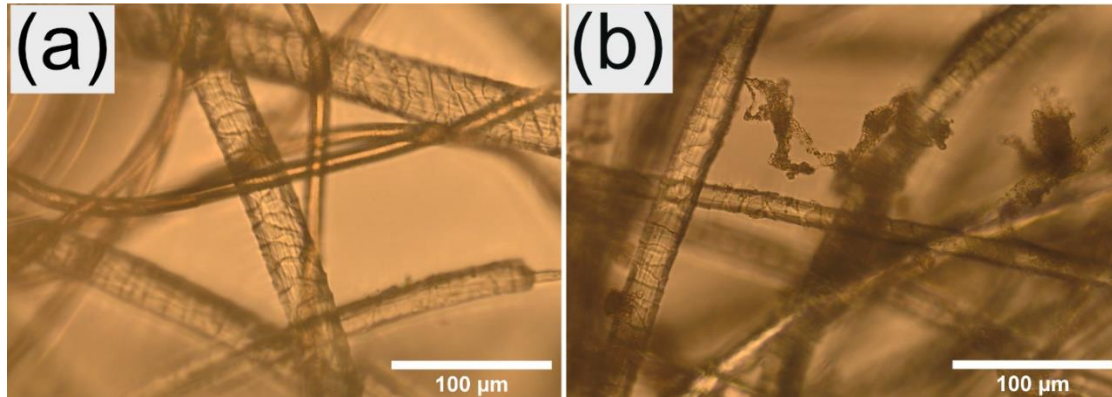
Technical approaches at UIBK

- Selective dissolution, separation and recovery of PA
- Selective dissolution, separation and recovery of PUR

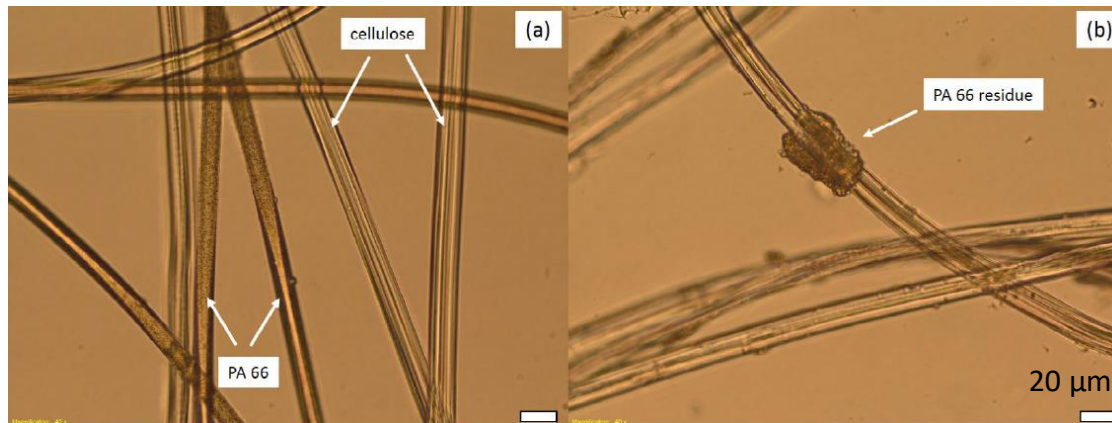
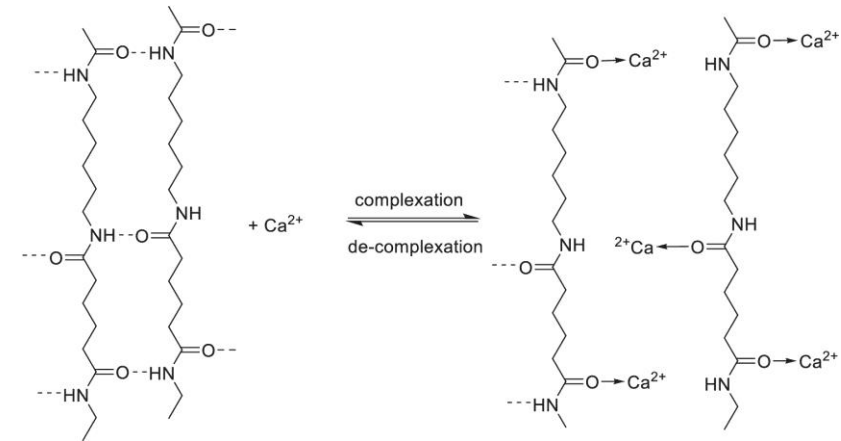
Elimination of minor component & regeneration of major component



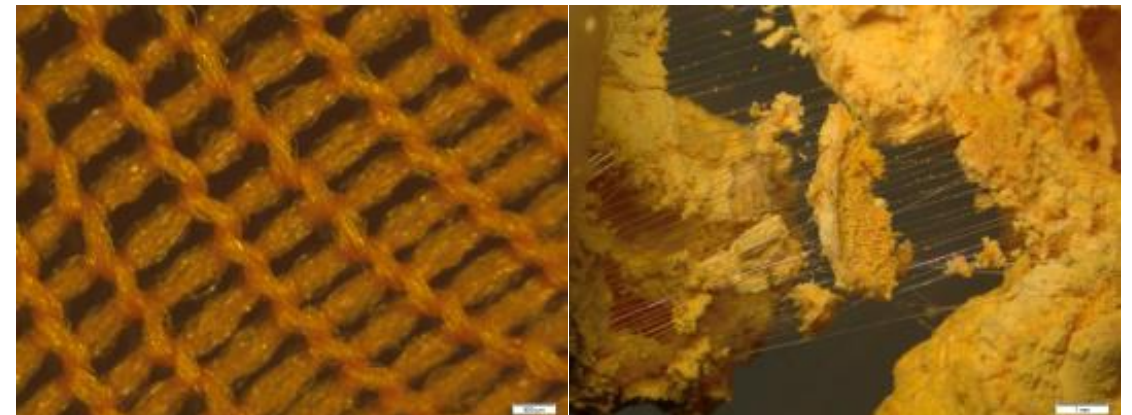
Selective dissolution, separation and recovery of PA



PA/Wool mixture

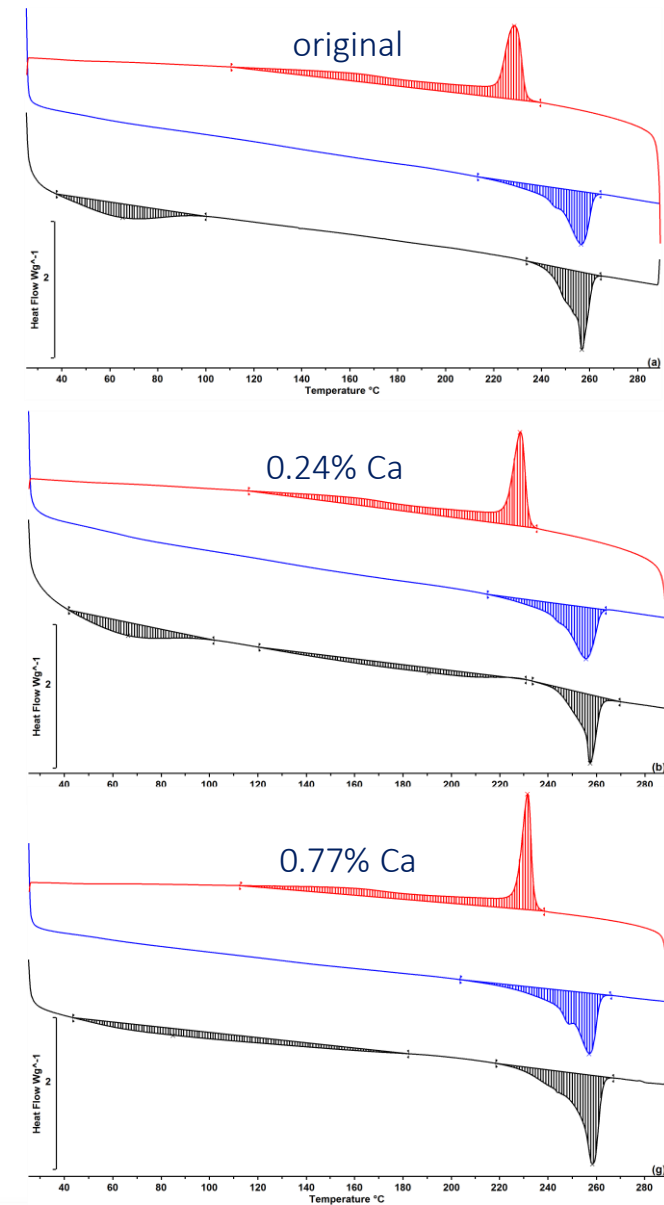
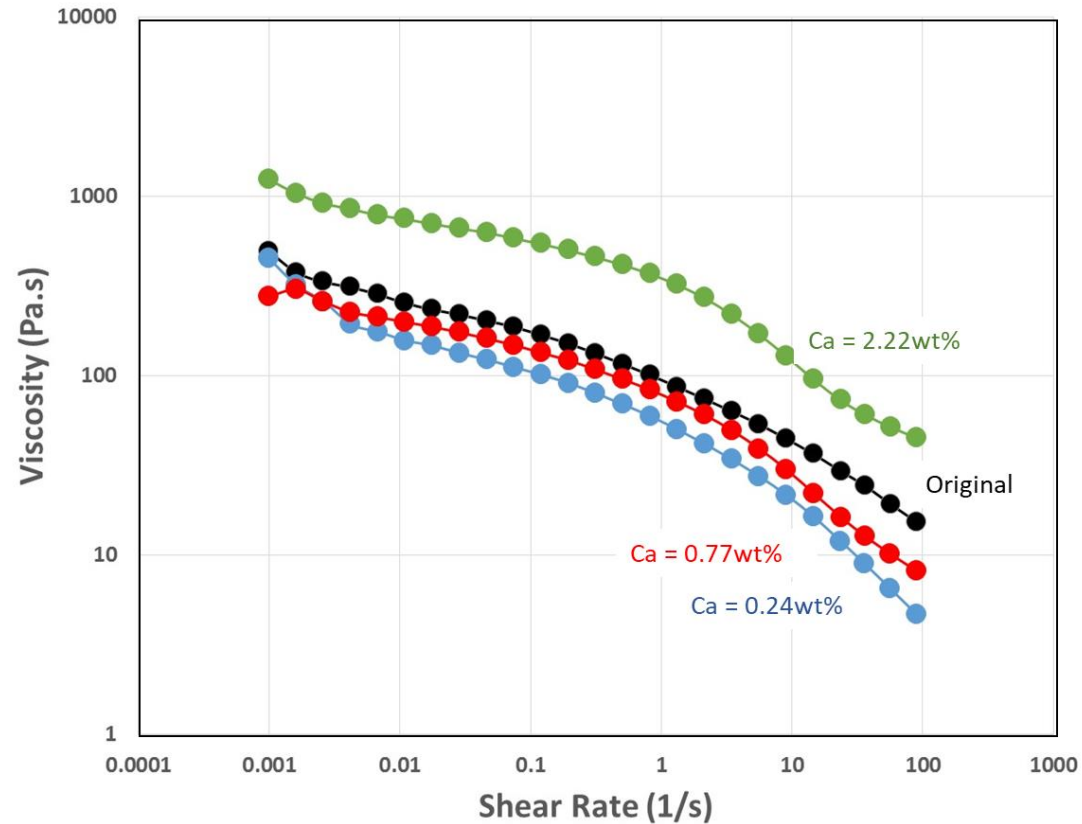


PA/Cellulose mixture

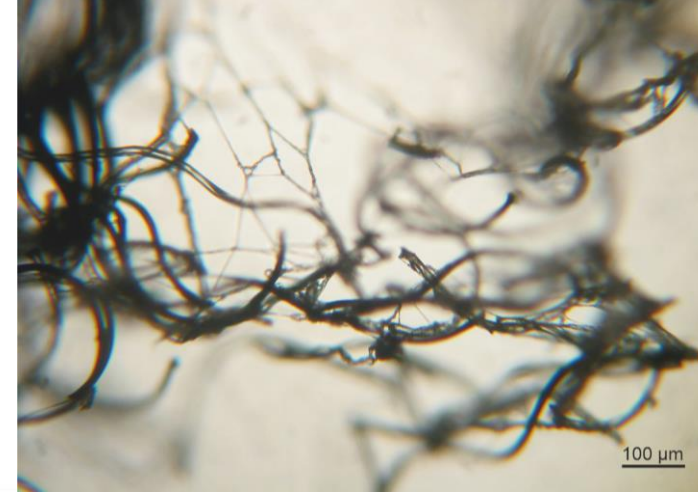
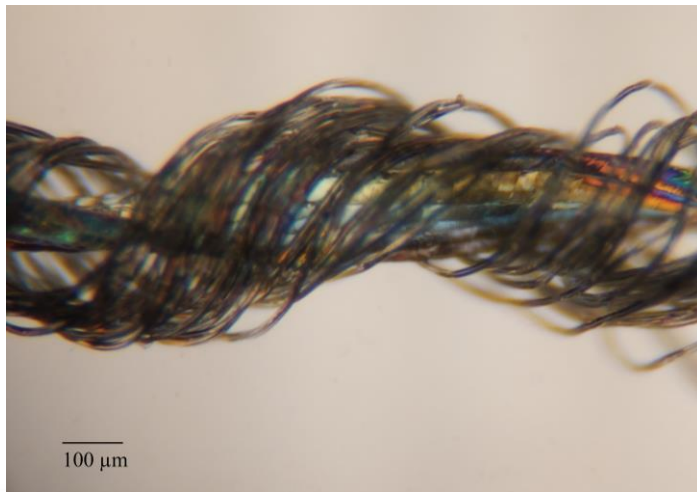
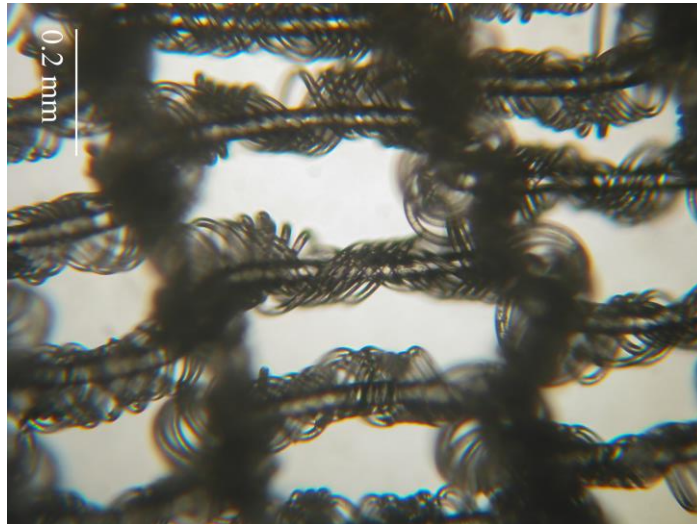


PA/PUR knitted fabrics

Selective dissolution, separation and recovery of PA



Selective dissolution, separation and recovery of PUR

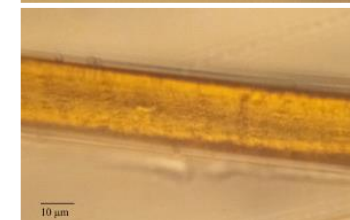


PUR separation from fibre mixtures

Model system	Main component	PUR	Recovered fibre
PET red	89,6%	10,4%	89,7%
PET orange	89,9%	10,1%	90,0%
PA yellow	89,7%	10,3%	89,6%
PA black	89,9%	10,1%	90,4%
Viscose blue	89,8%	10,2%	87,0%



PET red



PET orange



PA yellow



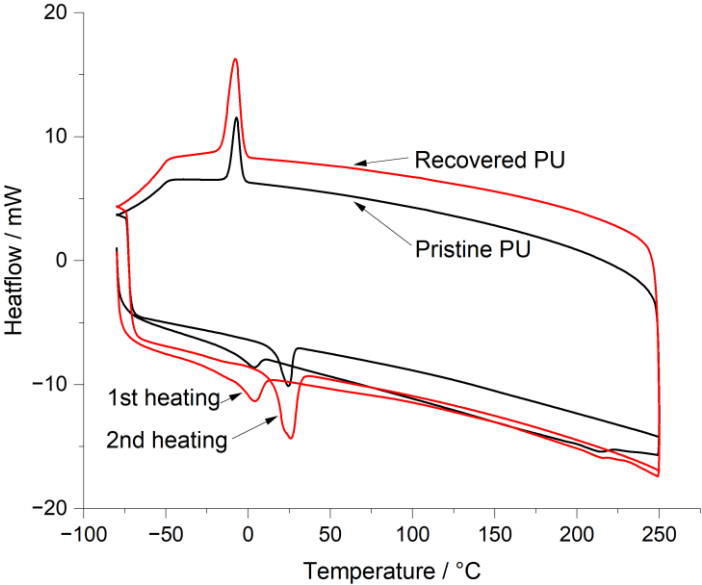
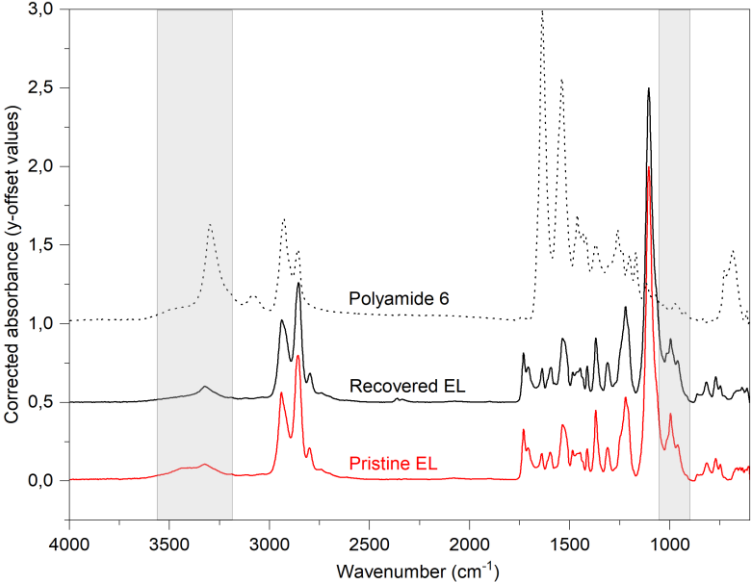
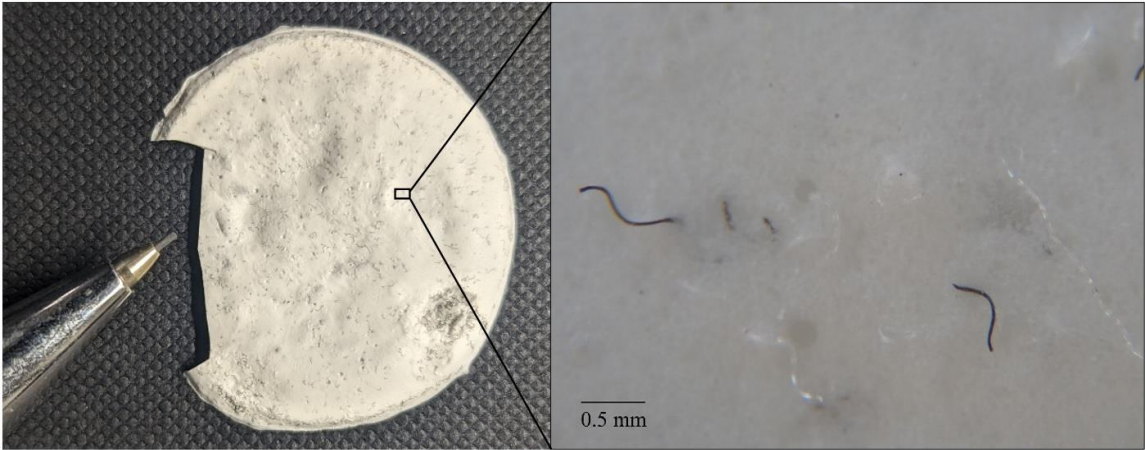
PA black

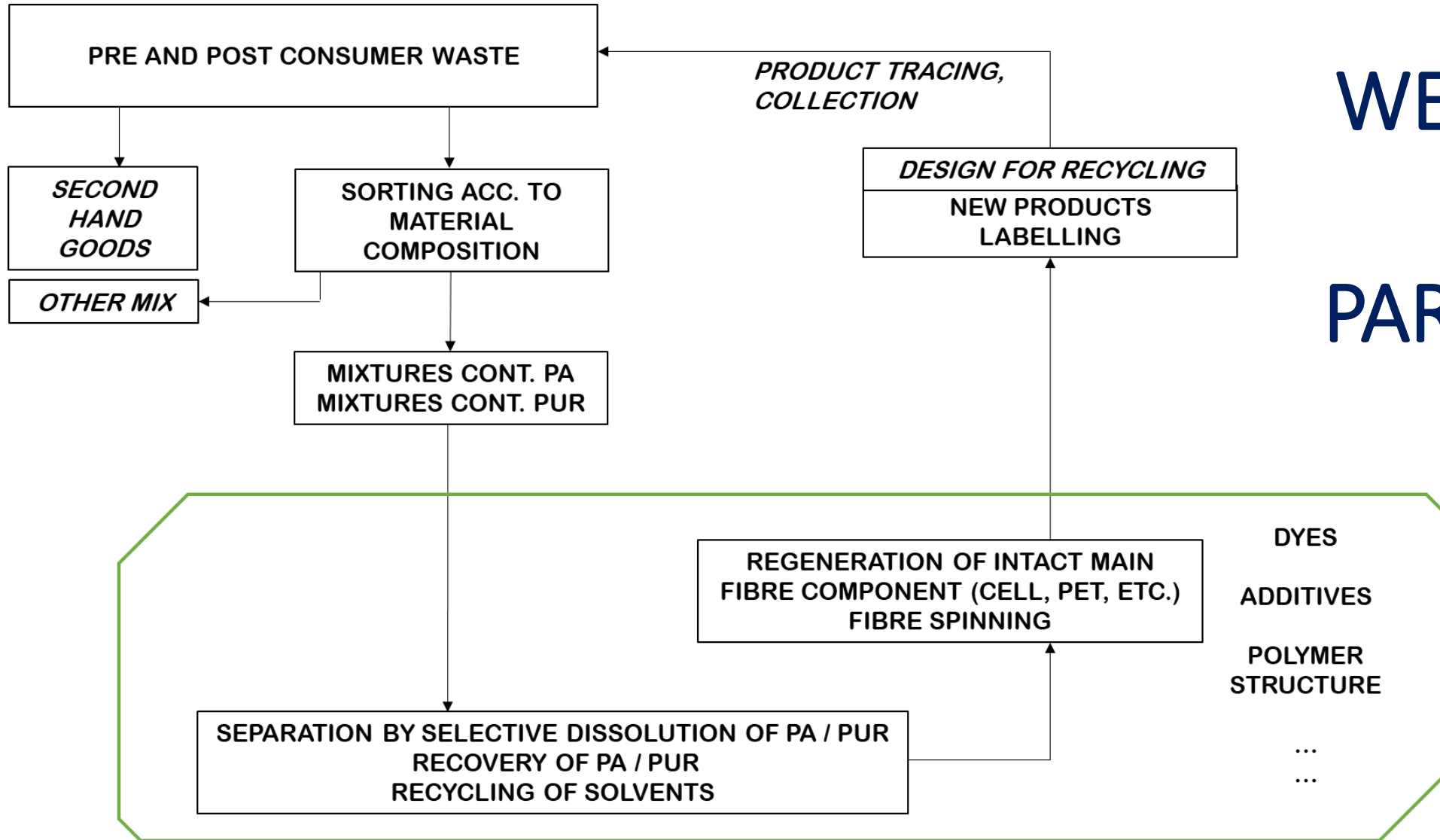


Viscose blue

patent pending

Separated PUR fraction





**WE NEED
ALL
PARTNERS**

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