CIRCULAR PLASTICS INITIATIVE
boosting plastics recycling and circularity

Innovation Forum for Plastics
Bringing together innovative solutions for the circular economy

19 April, Brussels

Hosted by EuRIC

CIMPA

A circular multilayer plastic approach for value retention of end-life multilayer films

Innovation Forum for Plastics

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19 April, Brussels

SIDE EVENT

CIRCULAR PLASTICS

cimpa

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EXECUTIVE SUMMARY

- Project Name: CIMPA
- Project start/end: 06/2021 – 11/2024
- Coordinator Name and Contact: Céline Chevallier, IPC – celine.chevallier@ct-ipc.com
- Project website: https://cimpa-h2020.eu/
- Project LinkedIn: https://www.linkedin.com/company/cimpa-project

This project has received funding from
the European Union's Horizon 2020 research and innovation programme
under grant agreement N° 101003864.

cimpa

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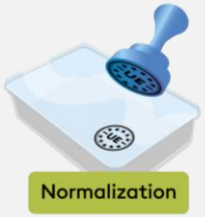
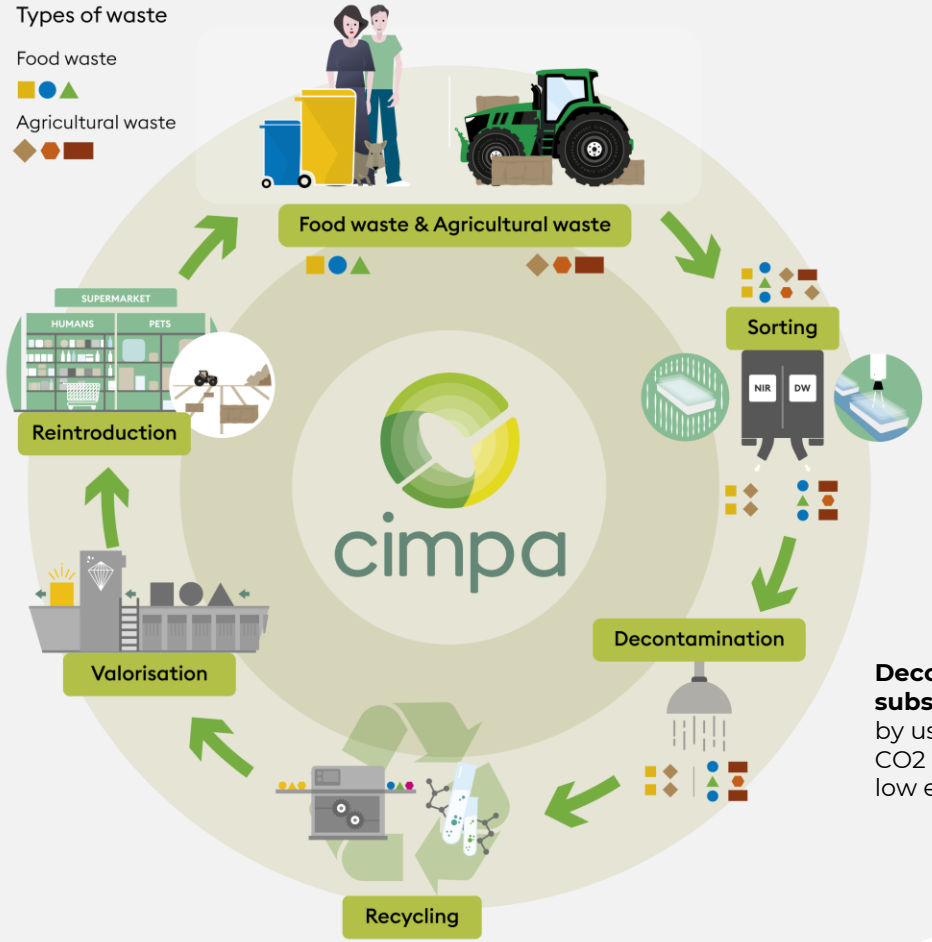
the European Union

PROJECT DESCRIPTION

To create a value chain for multilayers recycling and reuse in the food and agriculture packaging markets, in a systemic way, considering all aspects of the value chain



The recycling processes will be developed according to current European legislation. **Modification of such legislation and standards could be proposed** to increase multilayer films recyclability.



New designs will be proposed including :
Multilayer structures more recyclable
Multilayer compositions including recycled materials

NIR identification relies on inner characteristics of the multilayer films: Composition, transparency, number and thickness of layers... When a combination of NIR, metal detection and Digital Watermarking is used, **up to 99% of sorting efficiency can be expected.**

A novel pilot recycling line with in-line adaptive melt rheology control and additivation will be used **to stabilize and upgrade targetted properties of recycled stream**, such as melt flow properties (targetting e.g. less than ±15% variance in melt flow index for recycled feedstock).

Decontamination will remove toxic and hazardous substances, but also more than 80% reduction of VOCs, by using conventional stripping agents and supercritical CO2 if necessary. The Overall Migration Limit should be low enough to return to food contact applications.

Physical recycling is based on dissolution and precipitation of the polyolefin contained **in the *Multilayer films that cannot be mechanically recycled***. The process uses a low boiling point solvent, and up to 90% recovery of the PO present should be reached.

The objective of mechanical recycling is to make new high gas barrier films. 2 innovative processes will be used : continuous extensional flow mixing and multinanolayering extrusion. Bi-axial stretching can also improve the barrier properties if needed.

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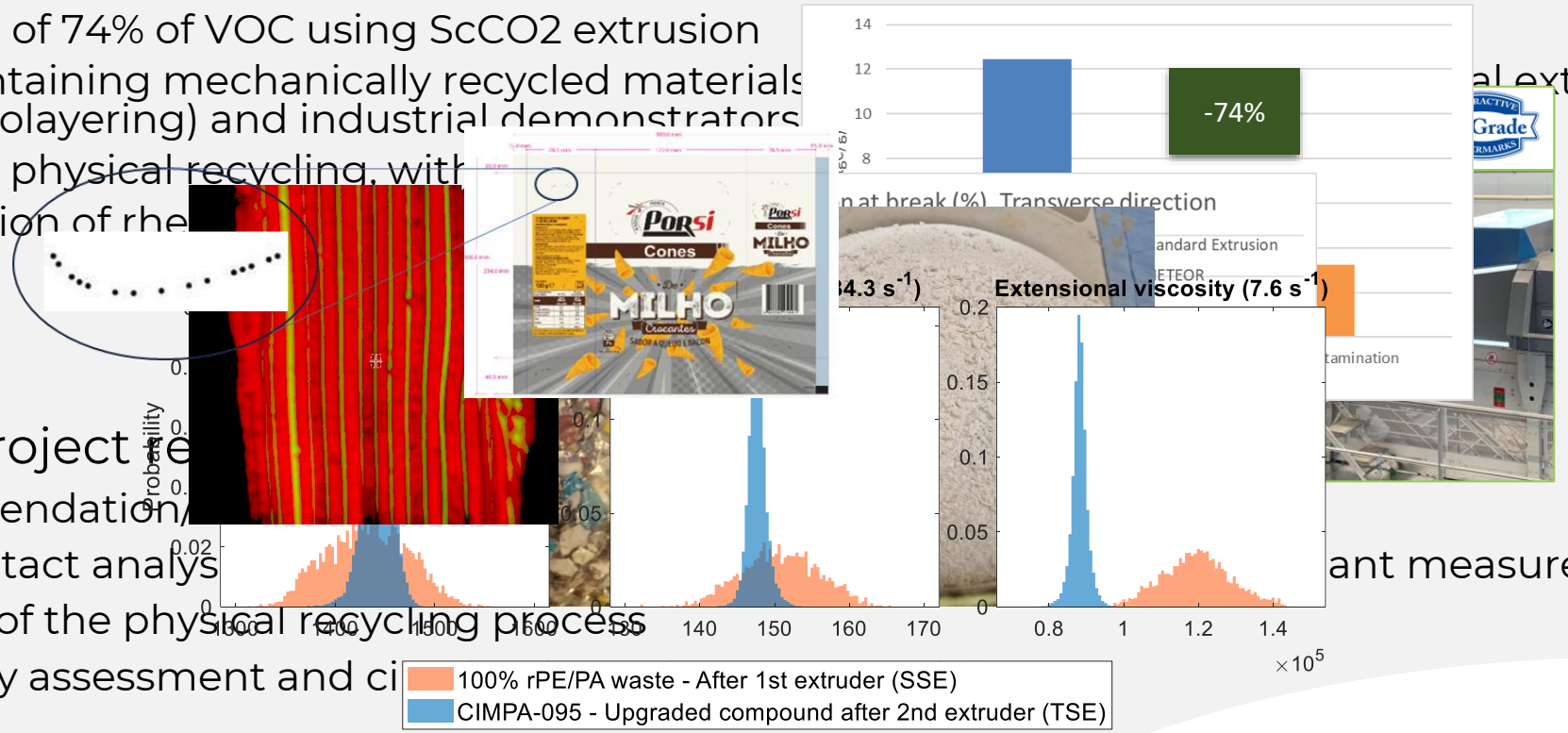
PROJECT OUTCOMES

- Achieved Project outcomes
  1. Sorting of multilayer flexible packaging in 3 families: PE/PA, PE/PET and metallized films, with efficiency up to 97% (combination of NIR and CurvCodes watermarking)
  2. Decrease of 74% of VOC using ScCO2 extrusion
  3. Films containing mechanically recycled materials al extruder or multinanolayering) and industrial demonstrators
  4. Lab scale physical recycling, with
  5. Stabilization of rhe



- Expected Project re
  1. Recommendation/
  2. Food contact analys ant measurements
  3. Scale up of the physical recycling process
  4. Circularity assessment and ci

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CLUSTERING

- Requested Collaboration points (*e.g.* joint activities, cluster events, future opportunities, collaborations)
  1. Webinar around LCA/LCC methodologies, recycling routes (chemical, physical, mechanical)
  2. Decontamination or food contact assessment cross characterizations
  3. Cluster events like common booth (eg Ecomondo)

- Key policy message

One key policy message is the critical need to establish comprehensive traceability systems from the outset of material formulation. This involves the implementation of economically viable solutions, such as digital product passports (DPPs), to ensure traceability across the entire flexible packaging value chain.

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Thank you!

Céline Chevallier, IPC, CIMPA Coordinator
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SolRec2

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Innovative digital watermarks and green solvents for the recovery and recycling of multi-layer materials

Innovation Forum for Plastics

Bringing together innovative solutions for the circular economy

19 April, Brussels

CIRCULAR PLASTICS

Funded by the European Union

GA number 101003532

EXECUTIVE SUMMARY

- **Project Name:** Innovative digital watermarks and green solvents for the recovery and recycling of multi-layer materials
- **Project start/end:** 06/2021 – 05/2024
- **Coordinator Name and Contact:** Pascal Négre pascal@negre.be
- **Project website:** https://solrec2.eu/
- **Project LinkedIn:** https://www.linkedin.com/in/sol-rec-2-project/?locale=en_US

Funded by the European Union
GA number 101003532

The Circular Plastics Cluster

CIRCULAR PLASTICS - Boosting the circular use of plastics

The Circular Plastics Cluster aims to boost the collection, sorting, cleaning, recycling and manufacturing of plastic products, including complex and multilayer materials.

Thus, it will turn this waste stream into a fully safe and sustainable circular model.

buddie Pack

cimpa a circular multilayer plastic approach for value retention of end-of-life multilayer films

CIRCULAR FoodPack

MERLIN

REMADYL

R3PACK

CIRCULARITY IN MULTILAYER PACKAGING SOL REC 2

CIRCULARITY IN MULTILAYER PACKAGING SOL REC 2

Funded by the European Union

GA number 101003532

The Circular Plastics Cluster

Our Key Solutions

- Innovating technologies to improve the sorting, cleaning, separation and recycling of plastics including multilayer and complex materials
- Novel mono-material packaging
- Fibre-based packaging solutions to replace single-use plastics
- Reuse of plastics for different purposes
- Drivers to foster adoption of consumers of new consumption habits
- A comprehensive sustainability assessment of the developed value-chains
- Profitable and sustainable business models

CIRCULAR
PLASTICS

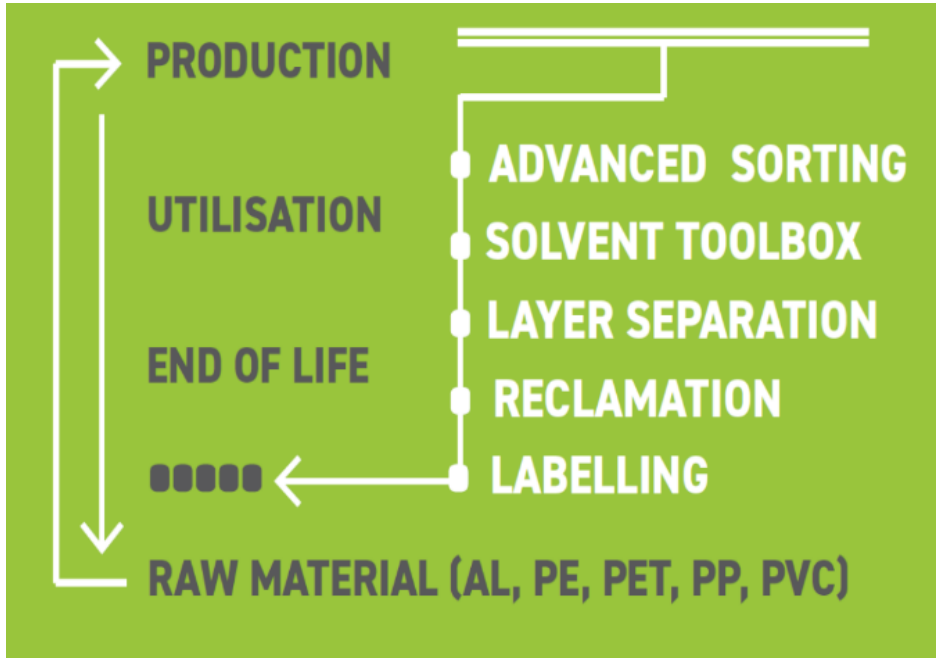
DISCOVER OUR INNOVATION TO BOOST PLASTIC RECYCLING AND CIRCULARITY.

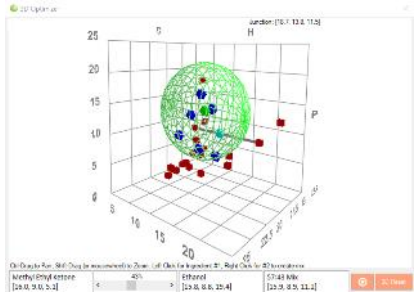
Funded by the European Union

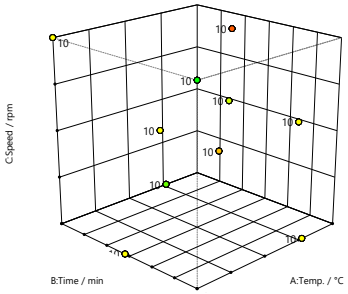
GA number 101003532

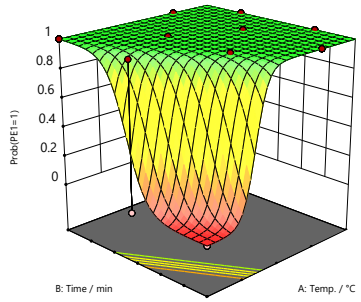
PROJECT DESCRIPTION

- Circularity in multilayer and blister packaging
- Improved sorting, separation and recycling of pharma blister packs and laminate consumer packaging through targeted sorting using CurvCode ™
- A toolbox of novel green solvent systems (TRL5) that can delaminate multi-layer packaging material and selectively dissolve
- Reclaim high purity laminates that can be reused, closing the loop in multipacks









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GA number 101003532

PROJECT DESCRIPTION

Laminate Packaging Samples

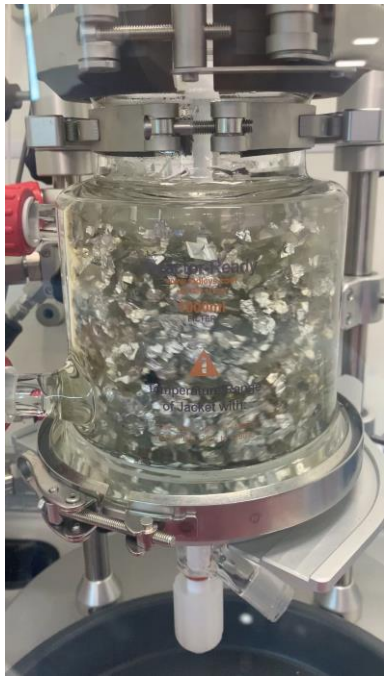
ALU/PE/PAPER

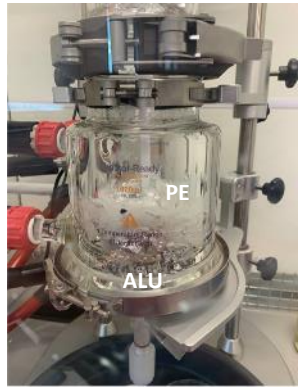
PE/ALU PE/ALU/PET

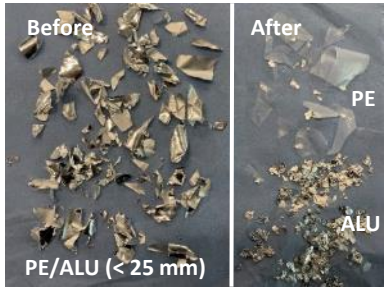
Lab-scale Experimental Set-up (50 g)

VELP AREX Digital Pro Hot-plate Magnetic Stirrers & VTF Probes

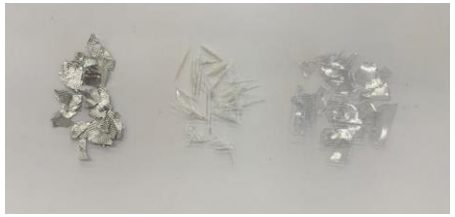
Reactor Experimental Set-up (1 L)

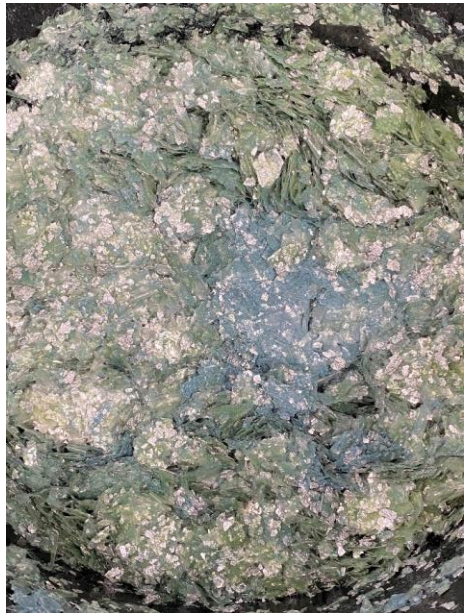






	Solution 1	Solution 2	Solution 3	Solution 4
PE/ALU/PET	PET, ALU, PE	ALU/PET or ALU, PET, PE	PE/ALU/PET	PET, ALU, PE
ALU/PE/PAPER	ALU, PE/PAPER	ALU, PE/PAPER	ALU/PE, PAPER	ALU, PE, PAPER
PE/ALU	ALU, PE	ALU, PE	PE/ALU	ALU, PE





CIRCULARITY IN MULTILAYER PACKAGING SOL REC 2

Funded by the European Union

GA number 101003532

PROJECT OUTCOMES

- Achieved Project outcomes
  1. Defined the composition of laminate packaging
  2. Developed a solvent toolbox for the delamination of all selected packaging configurations
  3. Designed digital watermark, implementation and sorting trial
  4. Established industry trends and market changes in packaging manufacturing
  5. Demonstrated and optimised the delamination process at 1L reactor scale
  6. Successfully separated delaminated layers
  7. Scaled up to 100L scale
  8. Liaised with industries to apply technology in actual case studies
- Expected Project results
  1. Introduce circularity to multilayer & blister packaging
  2. Advance sorting technologies, that will increase output homogeneity and quality
  3. Reduce waste sent to landfill or incineration
  4. Prevent material downcycling
  5. Achieve lifecycle monitoring
  6. Commercialise a green solvent based solution both affordable and environmentally friendly

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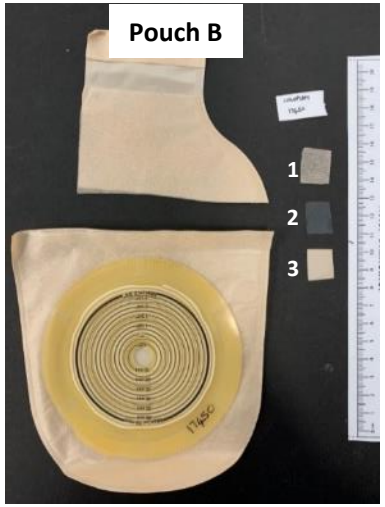
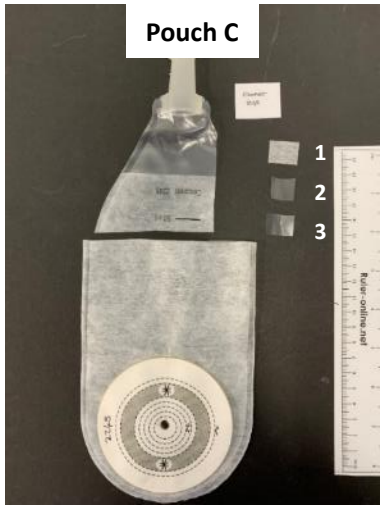
PROJECT OUTCOMES

Case studies

- Medical device trials

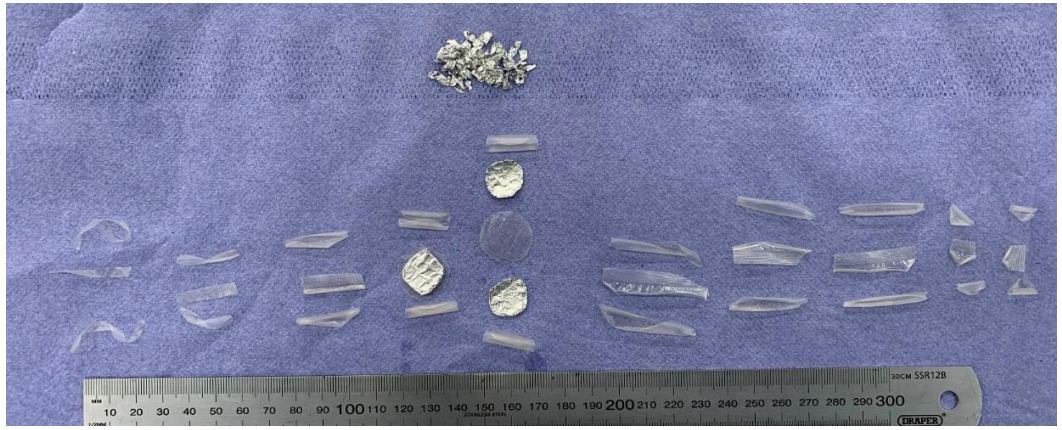




#	Pouch A	Pouch B	Pouch C
1	FABRIC	FABRIC	FABRIC
2	CLEAR FILM SEPARATING LAYER	CLEAR FILM - POUCH	CLEAR FILM - POUCH
3	CLEAR FILM - POUCH	COLOURED ‘PINK’ FILM - POUCH	CLEAR FILM - POUCH
4	COLOURED ‘BAIGE’ FILM - POUCH		
5	FABRIC		

Temperature /°C	Delamination Time/ min	
	PP	PE
90	< 30	< 60

Materials delaminated at 90 °C



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GA number 101003532

CLUSTERING

- Requested Collaboration points
  1. The circular plastics cluster
  2. Medical industries (managing their large primary multilayer waste output)
  3. Recyclers for advanced sorting (inventory and plastics managment)
  4. Collaboration with other RTOs to share knowlend, expliot the developed technology and apply/further develope in other field (e.g defense industry)
- Elaborate one key policy message that you have so far (e.g. policy development)

The SolRec 2 project is contributing in the comissions priority in building a climate-neutral, green, fair and social Europe by helping in the control and management of plastic waste by minimised material sent to landfill, introducing new circular loops and improving the quality of the reclaimed recycled product for greater and longer use.

Specifically SolRec2 will help in,

- Achieving climate neutrality targeted by 2050 (European Green deal, EC 2019c)
- Reach re-use and recycling of MSW to a minimum of:

  (Directive 2018/851)
  - 55wt % by 2025
  - 60wt % by 2030
  - 65wt % by 2035
- Provide appropriate calculation rules for the estimation of recycling yields.
  Implementing decisions 2019/1004 (MSW) and 2019/665 (for packaging waste)

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GA number 101003532

Thank you!

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solrec2.eu

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CIRCULAR FoodPack

Innovation Forum for Plastics

Bringing together innovative solutions for the circular economy

19 April, Brussels

SIDE EVENT

CIRCULAR PLASTICS

CIRCULAR FoodPack

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EXECUTIVE SUMMARY

- Project Name: Circular Packaging for Direct Food Contact Applications
- Project start/end: 01/06/2021 – 30/11/2024
- Coordinator Name and Contact: Fraunhofer IVV and Dr. Esra Kucukpinar
- Project website: www.circular-foodpack.eu
- Project LinkedIn: CIRCULAR FoodPack

CIRCULAR FoodPack

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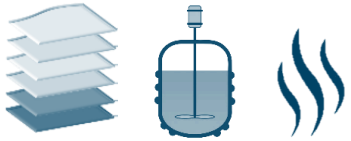
PROJECT DESCRIPTION

- Collection and sorting

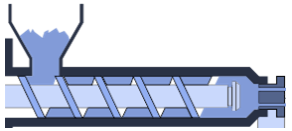
SUEZ POLYSECURE Identifying. Sorting. Optimizing. IRIS TECHNOLOGY GROUP

- Pre-treatments



GHENT UNIVERSITY Fraunhofer IVV KREYENBORG

- Recycling



Maastricht University SUEZ Fraunhofer IVV

- Food Safety & Compliance, Design for circularity,
- Demo Packaging Use-Cases

Fraunhofer IVV amcor SIEGWERK Research and Development

- LCSA and Business modelling

GHENT UNIVERSITY

PROJECT OUTCOMES

Achieved Project outcomes

1. Analysis of **waste collection:** Mono and multi-layer **flexible packaging waste** in Europe
2. Successful integration of **tracers into laminates for sortability** with boundary conditions for detectability

➔ Tracer-Based-Sorting (TBS): **97.5% - 99 % purity** (based on feedstock contamination) and **90% efficiency** at scale.

3. Sensor-Based-Specification (SBS) identifies multilayers and leads to **>90% PE rich flexible fractions**
4. PE-PCR (>300 kg) production at scale with **95% ink** and **95% odour removal** through IR-based deodorization
5. Mono-material laminate with **50% PE-PCR designed** for food-contact packagings, produced at industrial scale
6. **Machinability** validated: Upscaled production (>500 kg packagings): Coffee pouches and sachets for cosmetics

Expected Project results

1. **Cleaning efficiencies of novel recycling cascades** through challenge tests
2. **Guidelines on packaging design** for circularity including PCR integration
3. Knowledge-gain on **environmental, economic and social footprint through holistic LCSA** of recycling cascades
4. **Exploitation, marketing and financial plan** for **Key Exploitable Results**
5. Suggestions for **standardization** in EU food packaging industry through clear rules and targets

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CLUSTERING

- Collaboration points

1. Joint dissemination & communication with circular plastics cluster projects (round tables, workshops, …)
2. Joint Webinars & conferences: Sustainable food plastic packaging design and boosting recycling
   Shared booths with the **Circular Plastics Cluster** at **Ecomondo** Rimini (2022 & 2023)
   Plastics Recycling World Expo in Essen 2023
   CIRCULAR FoodPack Sorting Webinar with CIMPA (June 2023)
   CIRCULAR FoodPack Conference at Fraunhofer IVV (November 2023)
3. Joint policy briefs to European Commission with cluster projects

- Elaborate one key policy message that you have so far (e.g. policy development)

Close collaboration along value chain: Collection and sorting, decontamination & recycling, conversion & brand owners

- Novel mono-material based flexible packagings with **PCRs** designed for food packaging applications
- **Recycling of multilayers** possible by physical/dissolution-based recycling at scale

Reliable, clear EU regulations and targets for PCR content in packaging, so that financial risk for investments is lower

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Thank you!

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Group Leader – Functional Materials
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MERLIN:

Increasing the quality and rate of MultilayER packaging recycLINg waste

Innovation Forum for Plastics

Bringing together innovative solutions for the circular economy

19 April, Brussels

SIDE EVENT

CIRCULAR PLASTICS

MERLIN

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EXECUTIVE SUMMARY

- Project Name: MERLIN: Increasing the quality and rate of MultilayER packaging recycLINg waste
- Project start/end: June 2021 – May 2024 (project extension expected)
- Coordinator Name and Contact: Mr. Cesar Aliaga (ITENE)
- Project website: https://merlinproject.eu/
- Project LinkedIn: https://www.linkedin.com/company/merlinproject/

MERLIN
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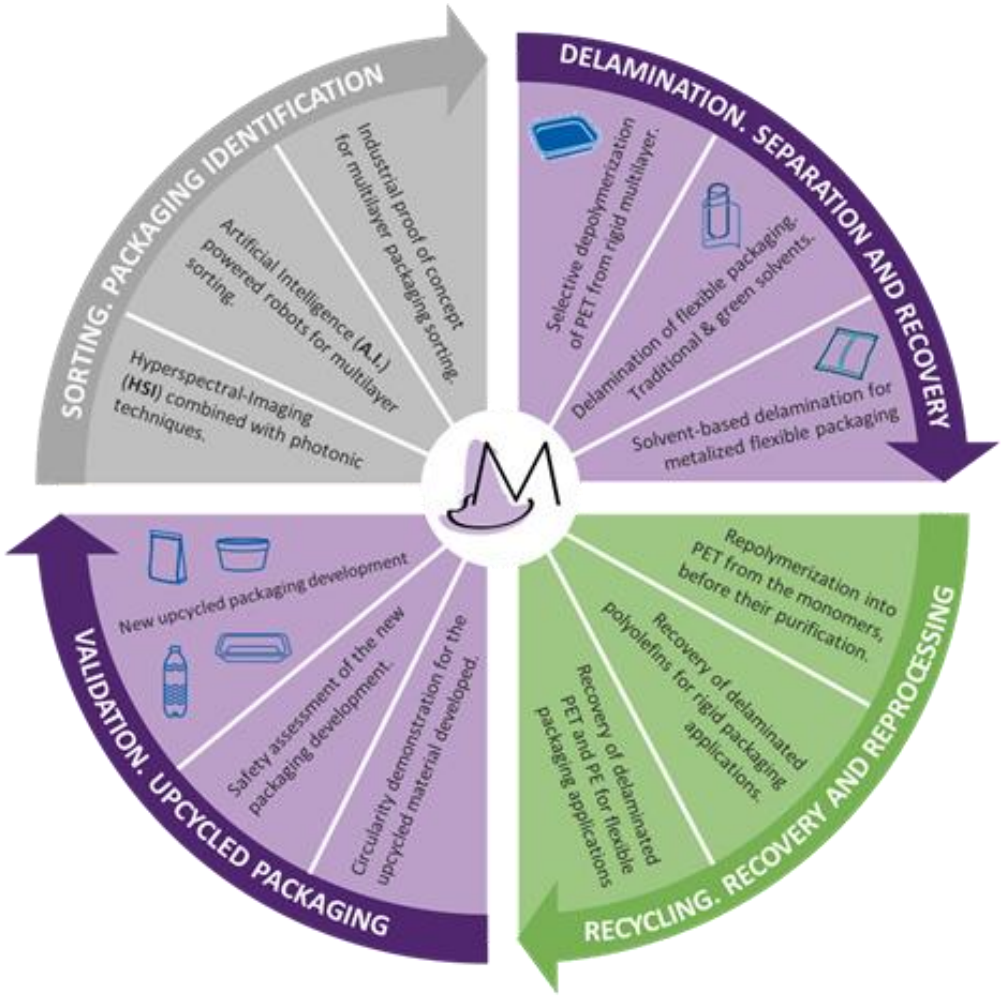
PROJECT DESCRIPTION

MERLIN is an **INNOVATIVE** and **SYNERGIC PROJECT** that aims to create promising technologies and processes to improve the **SORTING**, **DELAMINATION** and **RECYCLING** of rigid and flexible **MULTI-LAYER PLASTIC PACKAGING WASTE**, from post-consumer and post-industrial sources, to obtain new high-performance packaging solutions for the **FOOD PACKAGING INDUSTRY** and move towards a more **CIRCULAR ECONOMY**.



MERLIN

Funded by the European Union

PROJECT OUTCOMES

- Achieved Project outcomes
  1. WP1: Identification, distribution and quantification of multi-layer packaging materials (rigid, flexible metallised and non-metalised) in a waste treatment facility With adapted Artificial Intelligence (A.I.) powered robots.
  2. WP1: Development of a monitoring system prototype for identifying the multi-layer polymer structures based on NIR-HSI and/or other feasible monitoring technologies. Developed up until the testing stage.
  3. WP1: Integrated photonic and robotic systems into a real-time multi-layer packaging sorting, testing their feasibility in an industrial proof-of-concept at the waste treatment plant. Developed up until factory acceptance test and plant validation.
  4. WP2: Development of PET depolymerization from rigid multi-layer packaging via solvolysis processes. Material produced for WP3.
  5. WP2: Development of non-metalized film delamination using traditional solvents (e.g., methanol, ethanol) and green solvents (such as CO2) in supercritical conditions, and/or a combination of both. Delamination efficiency >80% was achieved.
  6. WP2: Development of PET delamination from metalized flexible packaging using solvent-based process for the selective dissolution of polymers and adhesives under mild conditions. Material produced for WP3.
  7. WP3: Valorisation of recycled PET for flexible application with chain extenders.
  8. WP3: Valorisation of PO for rigid packaging applications with maleic anhydride grafting.

- Expected Project results
  1. WP4: validation with production of packaging (demonstrators)
  2. And all the other work packages regarding LCA studies, regulatory frameworks etc

MERLIN
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CLUSTERING

- Requested Collaboration points (*e.g.* joint activities, cluster events, future opportunities, collaborations)
    1. Joint workshops and webinars. Up to November 2024, MERLIN foresee 1 webinar on delamination solutions for multi-layer, 1 webinar on DSS developed during the project, 2 meetings with standardization committees and stakeholders
    2. Participation to MERLIN final event
    3. Exchange of Advisory Board members between the projects
    4. Possible discussion for future joint application to other Grants

- Elaborate one key policy message that you have so far (e.g. policy development)

- Compliance with both the EU-level and the national legislation is a crucial element in ensuring the success and effectiveness of the Merlin project
- Policymakers strive to ensure harmonisation across the entire EU by setting unified recycling standards, both in terms of quantity and quality
- However, the different regions adopted parallel, yet diverging, strategies to comply with the EU standards, consequently creating substantial differences in the achievement of the targets (e.g. different structure and functioning of the Extended Producer Responsibility Schemes and Deposit Return Schemes, which cause different degrees of effectiveness)
- At the same time, the objective of the ultimate achievement of a fully circular economy in the packaging sector should also take into consideration the equally pivotal need to preserve well functioning of the single market by minimising the enforcement of excessive administrative and financial burdens on the industry

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Thank you!

M. Gravendeel

SCAN ME

COFFEE BREAK

10.30-11.00