

# Reciclado y revalorización en materiales innovadores de PET opaco- RevalPET UP



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# Polyethylene Terephthalate (PET).

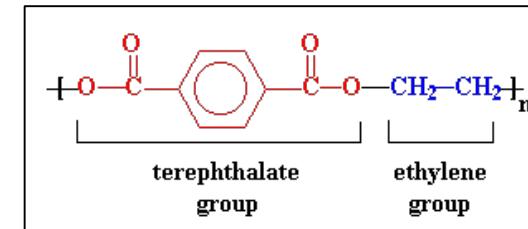
ethylene glycol + terephthalic acid

INMA

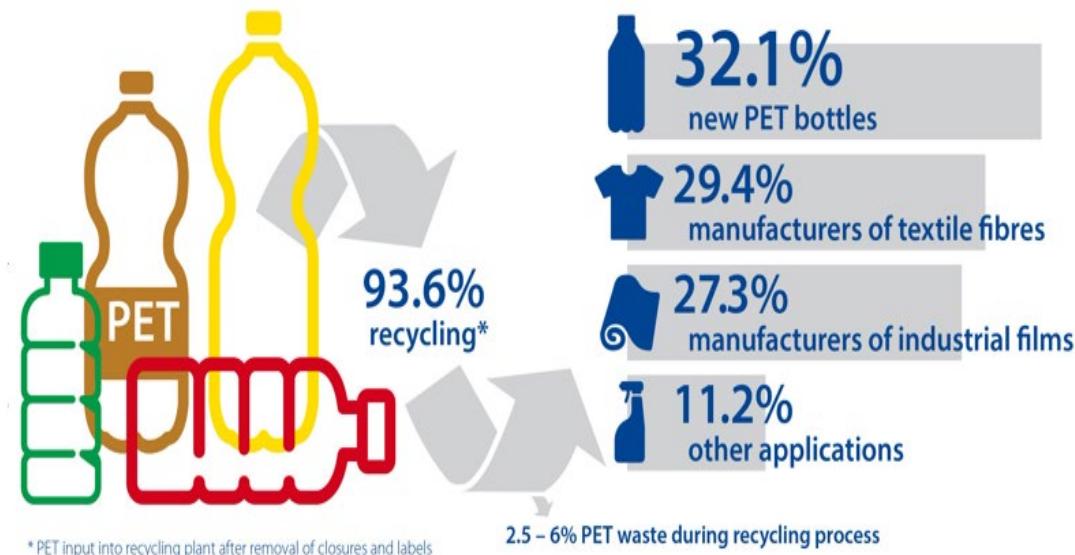
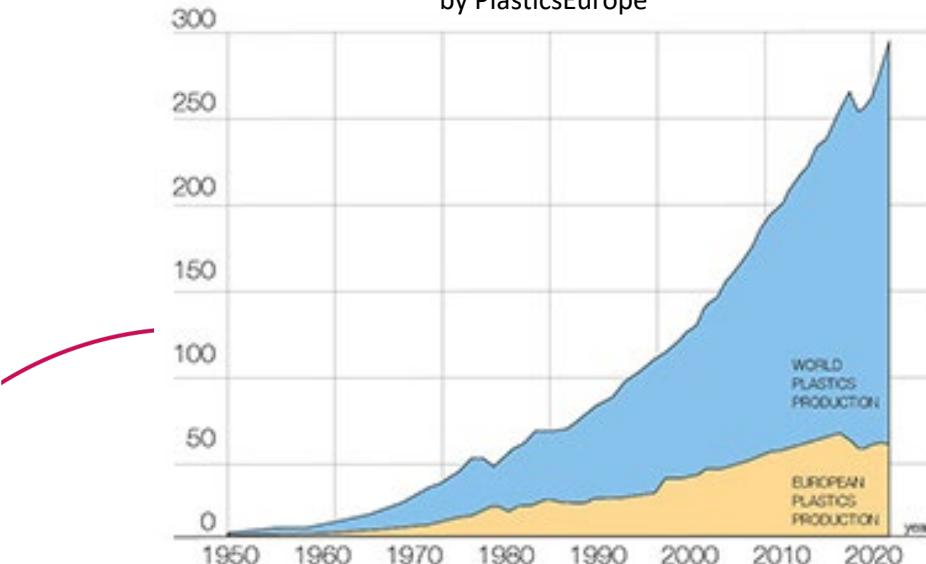
Reval PET UP

## CHARACTERISTICS.

- Transparent color.
- High clarity.
- Good chemical resistance (chemical sterilization).
- Good gas and moisture barrier.
- High impact resistance.
- Temperature resistance
- Low cost.
- Food safe material (FDA).
- **Recyclability**.



Plastic World Production.  
by PlasticsEurope



# Opaque Polyethylene Terephthalate (o-PET).

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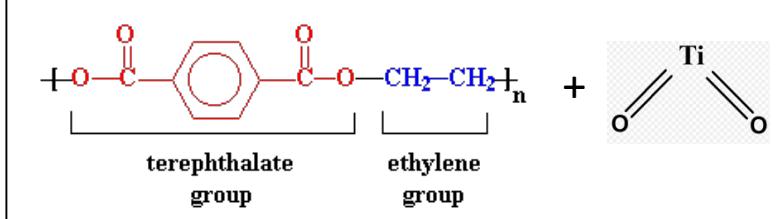
Reval PET UP

## Problems:

Transparency - UV protection (milk).

Low temperature resistance - sterilization (food reuse).

ethylene glycol + terephthalic acid + inorganic opacifier ( $TiO_2$ )



## CHARACTERISTICS.

- Opaque color (UV protection).
- Good chemical resistance.
- Good gas and moisture barrier.
- Low impact resistance.
- Temperature resistance
- **Low cost.**
- Food safe material (FDA).
- **Non recyclable.**



# Recycling and revaluation of milk bottles into innovative materials

## EFA329/19

(Programa Interreg  
España/Francia/Andorra - POCTEFA 2014-  
2020)

1/10/2019-1/06/2022

Víctor Sebastián  
Silvia Irusta



INMA

Dinamizar la innovación alrededor de los materiales reciclados a base de PET opaco, con el fin de contribuir a la preservación del medio ambiente y al mantenimiento de la competitividad del sector del reciclado



<https://www.youtube.com/watch?v=uI6M5zXBQNo>

Proyecto cofinanciado por el Fondo Europeo  
de Desarrollo Regional

Interreg  
POCTEFA<sub>4</sub>



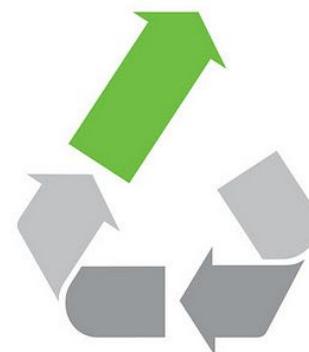
CSIC

Universidad  
Zaragoza

# OBJECTIVES

- To improve the recycled opaque PET properties by reactive extrusion.
- The improved recycled PET will be blended with other polymers to increase the mechanical properties.
- The obtained blends will be applied in the construction sector:

- 3D printing
- Foaming



UpCycling

RevalPET UP

Proyecto cofinanciado por el Fondo Europeo de Desarrollo Regional



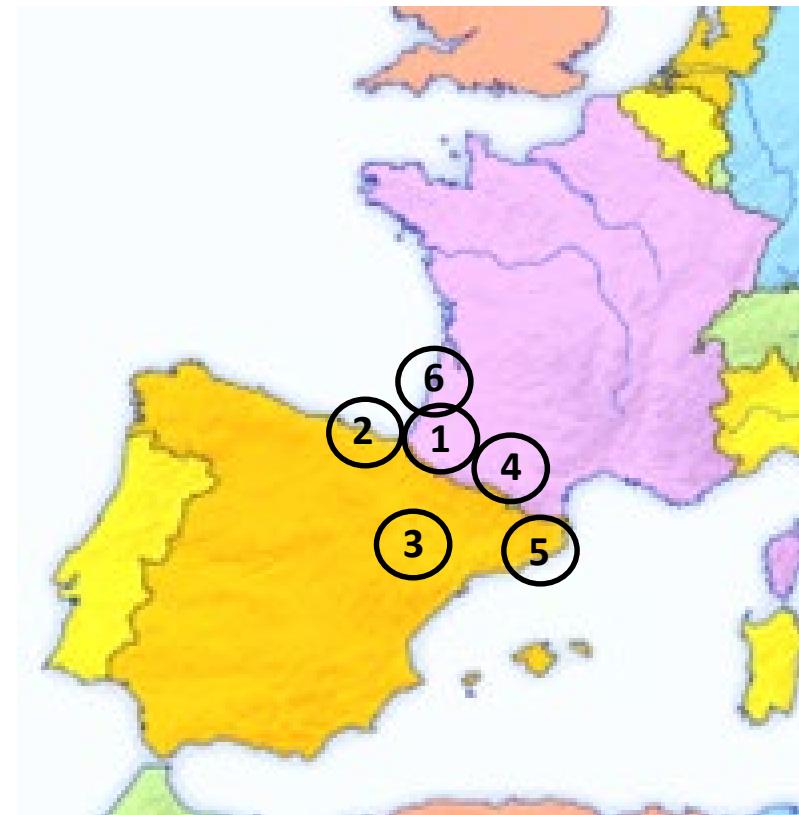
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Universidad  
Zaragoza

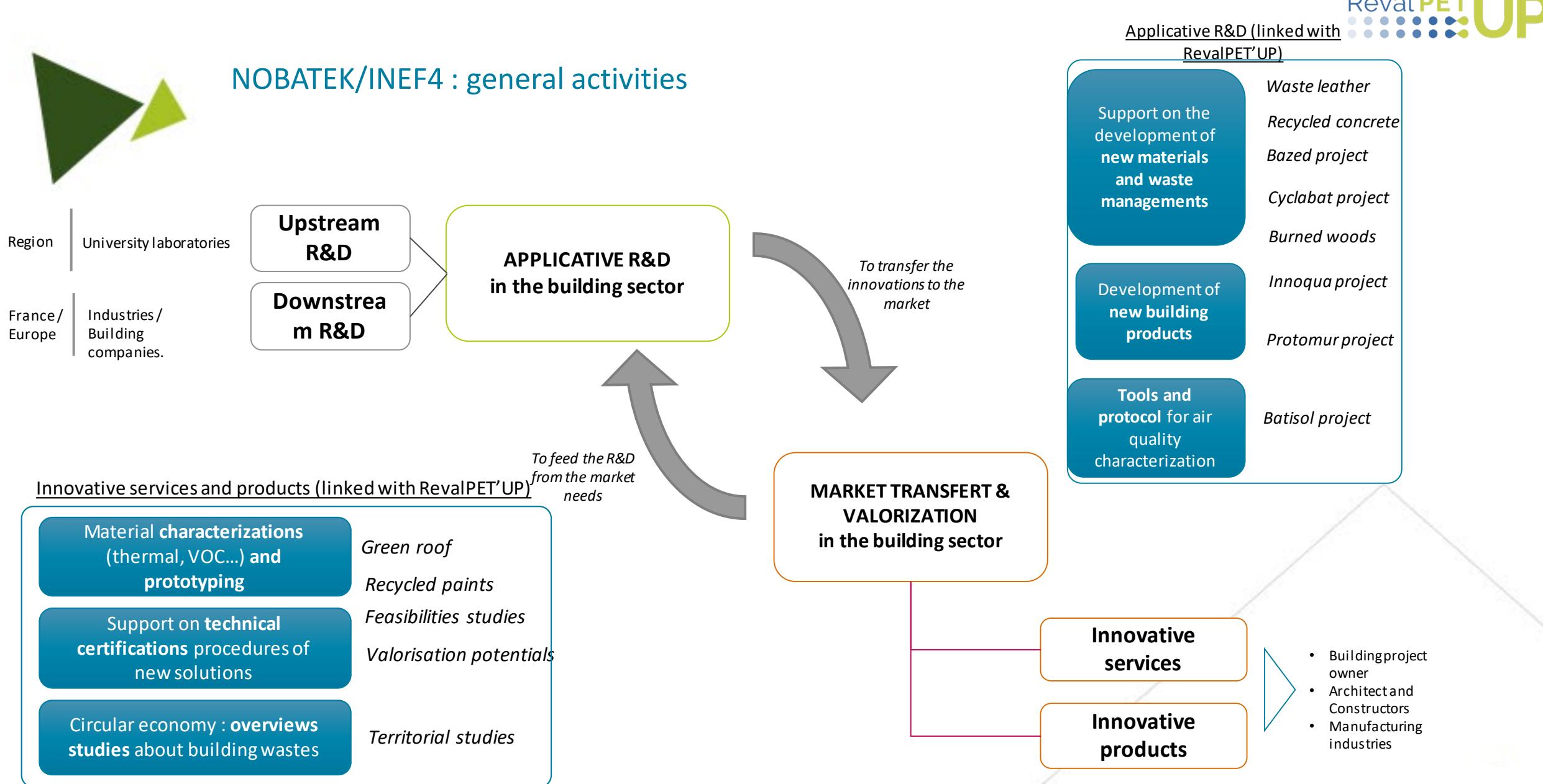
# RevalPETUP project.



- 1. Université de Pau et des Pays de l'Adour**  
Processing and rheological properties of thermoplastic polymeric materials.
- 2. University of Pais Vasco.**  
Structure, morphology and properties of polymer blends.
- 3. University of Zaragoza. INA.**  
Materials microcharacterization.
- 4. Ecole Nationale d'Ingénieurs de Tarbes.**  
Thermal and mechanical properties of polymers, fatigue characterization. 3d printing
- 5. Polytechnique University of Cataluña.**  
Processing and industrial application of recycled polymer materials. Reactive extrusion
- 6. NOBATEK/INEF4**

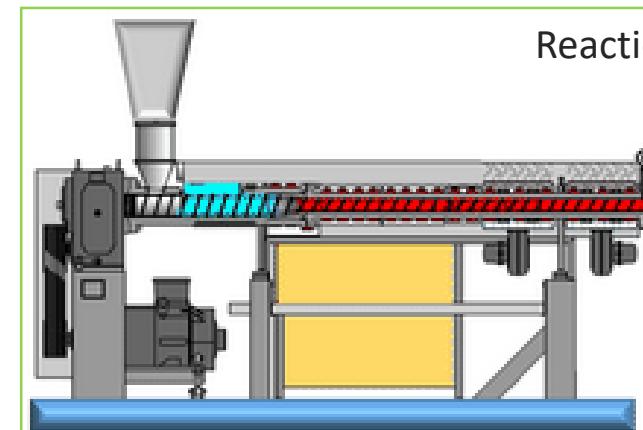
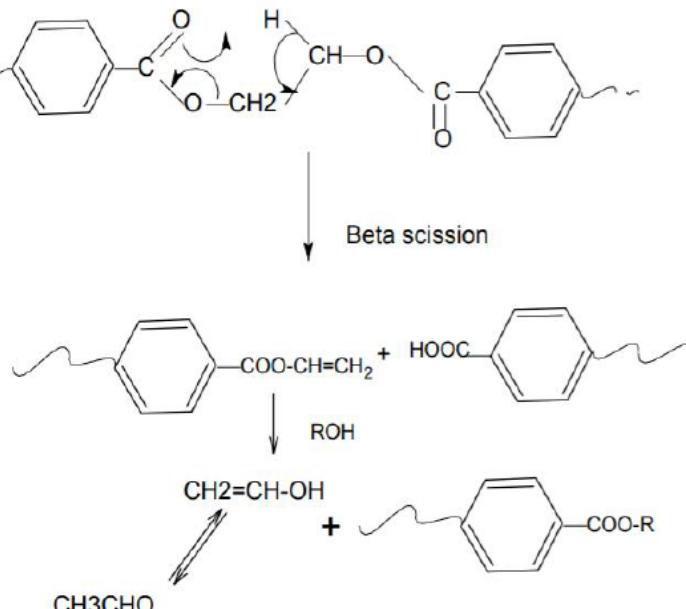
Suez RV Plastiques Atlantique (Bayonne, France): plastic provider.

## NOBATEK/INEF4 : general activities



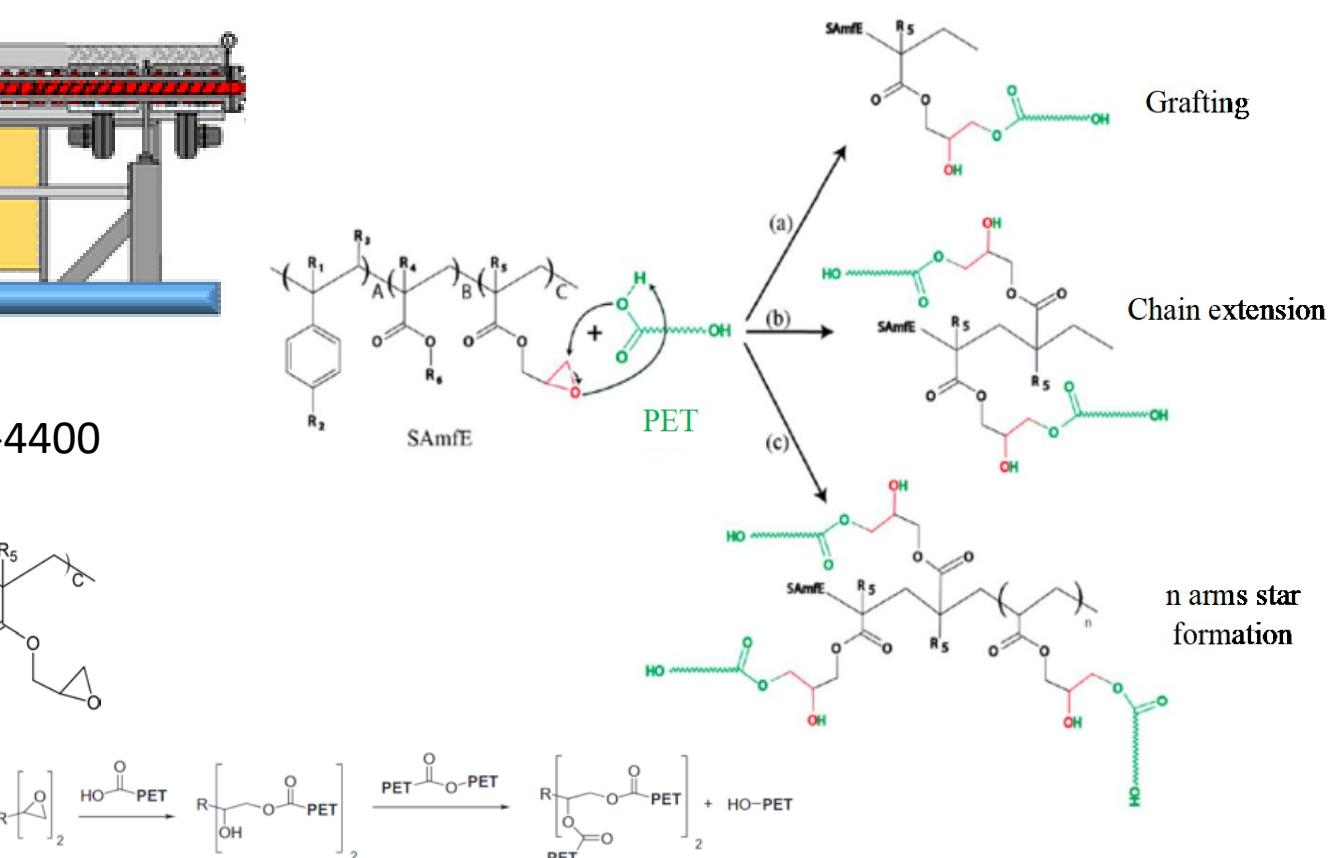
Reactive extrusion was used to modify the rheological and mechanical properties of PET by treating with *Styrene-acrylic multi-functional epoxide oligomer* as the chain extender

Schematic representation of beta scission of PET during processing.



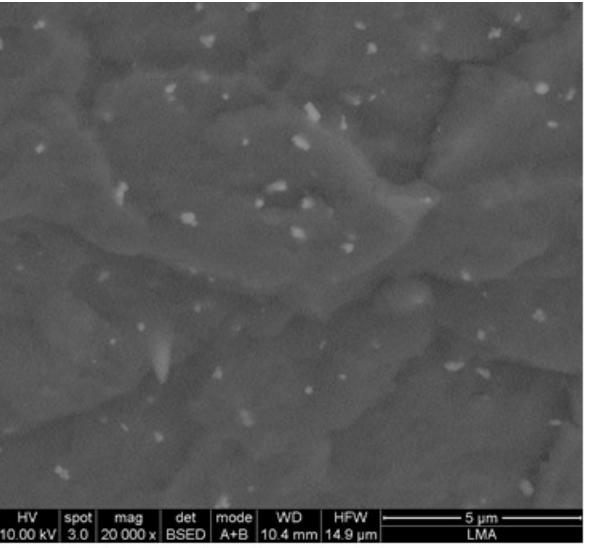
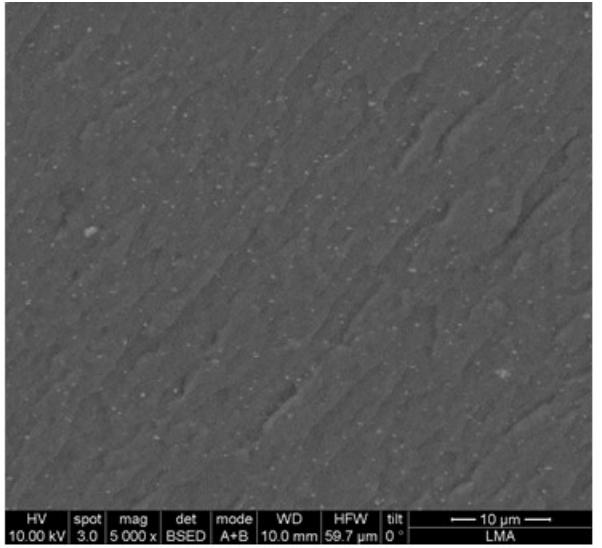
Joncrysyl-ADR-4400

Reactions of -OH terminal groups of PET with Joncrysyl.

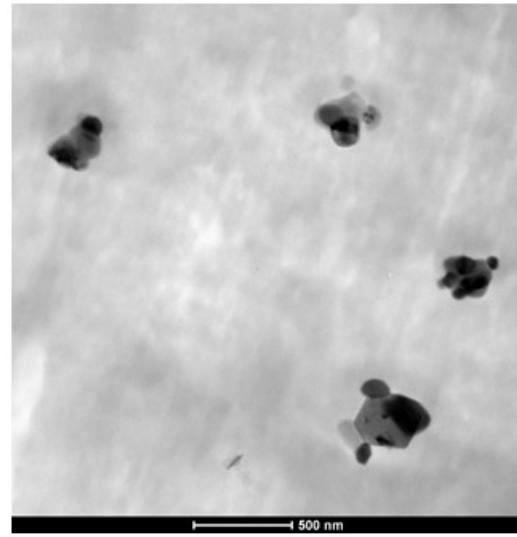
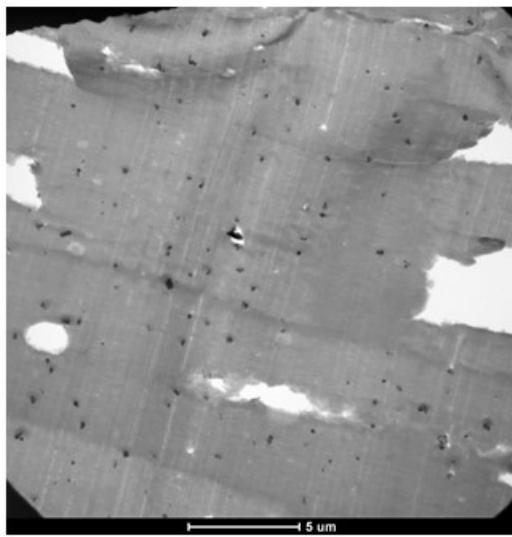


r-PET

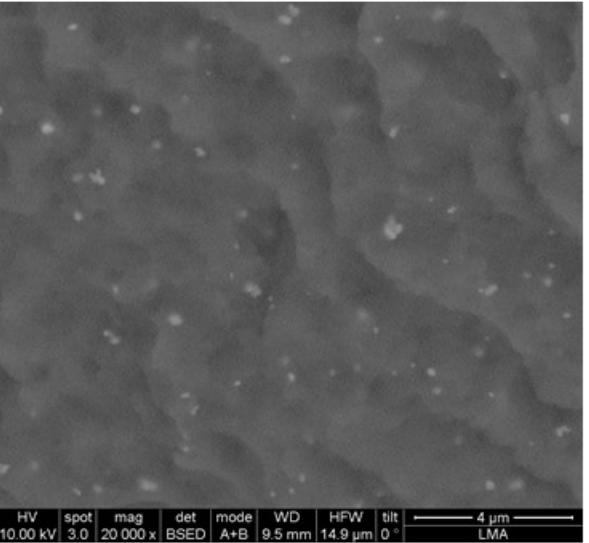
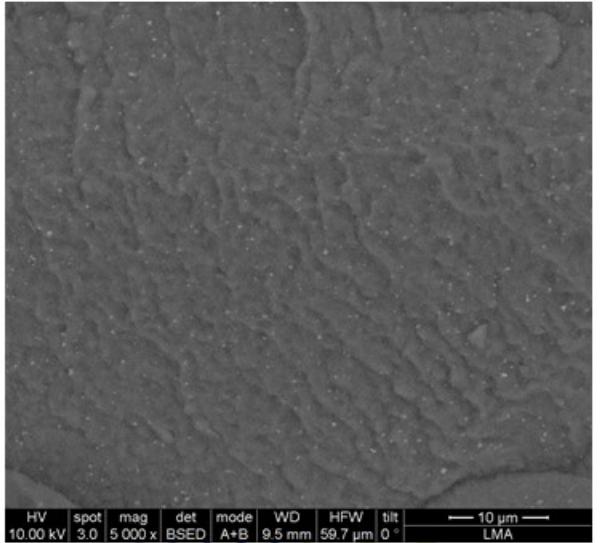
SEM results



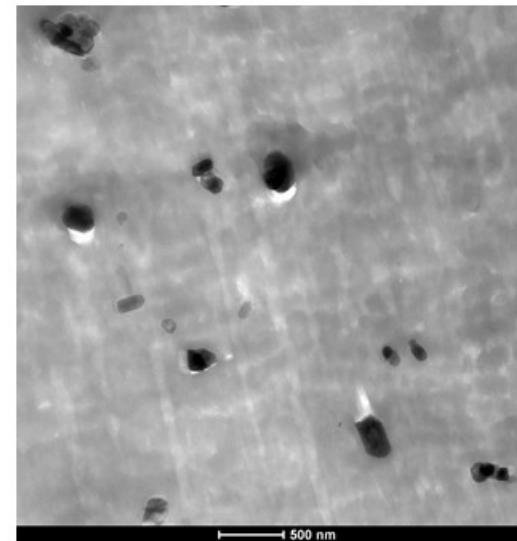
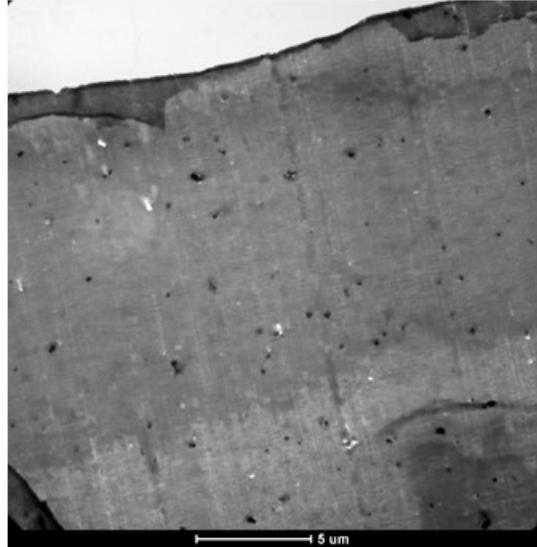
Recycled PET



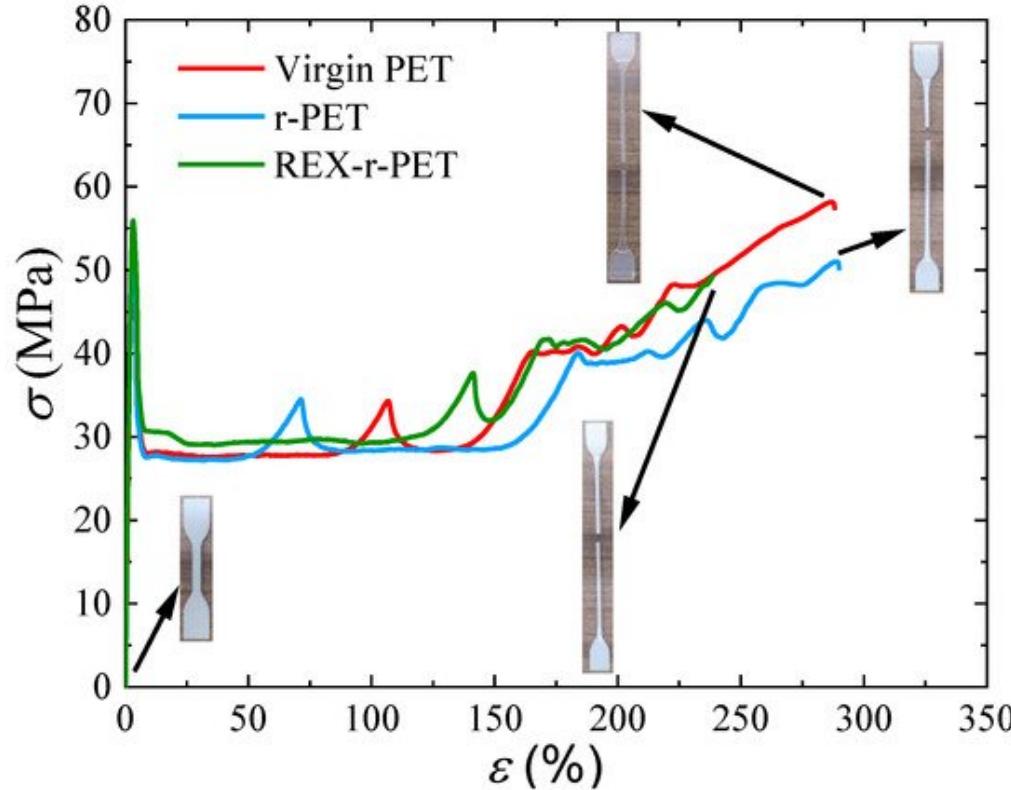
REX-r-PET



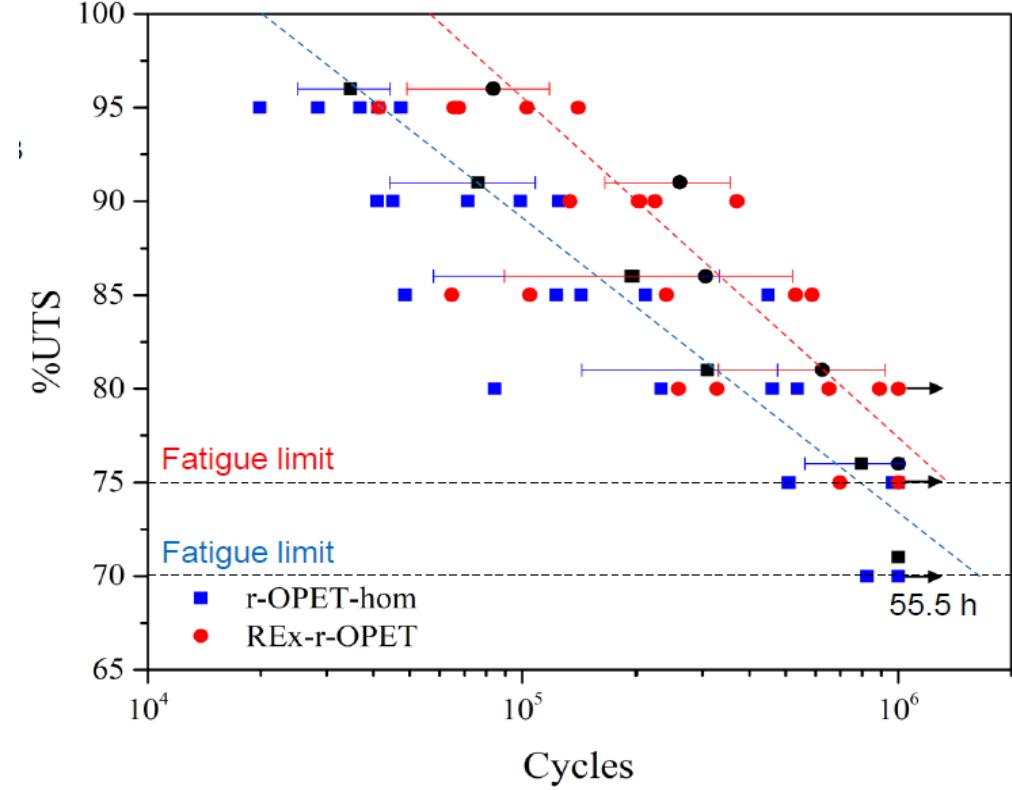
REX r-PET



## Mechanical properties

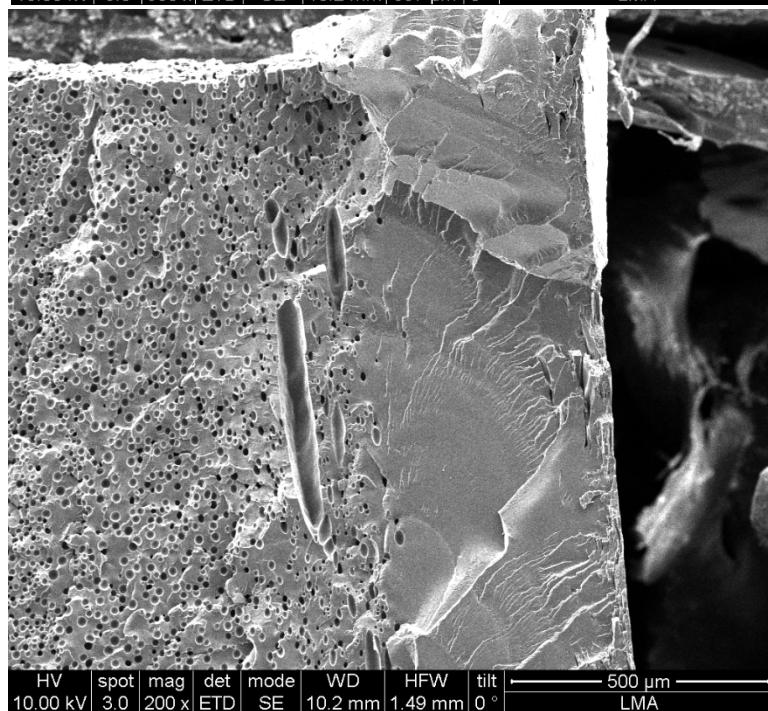
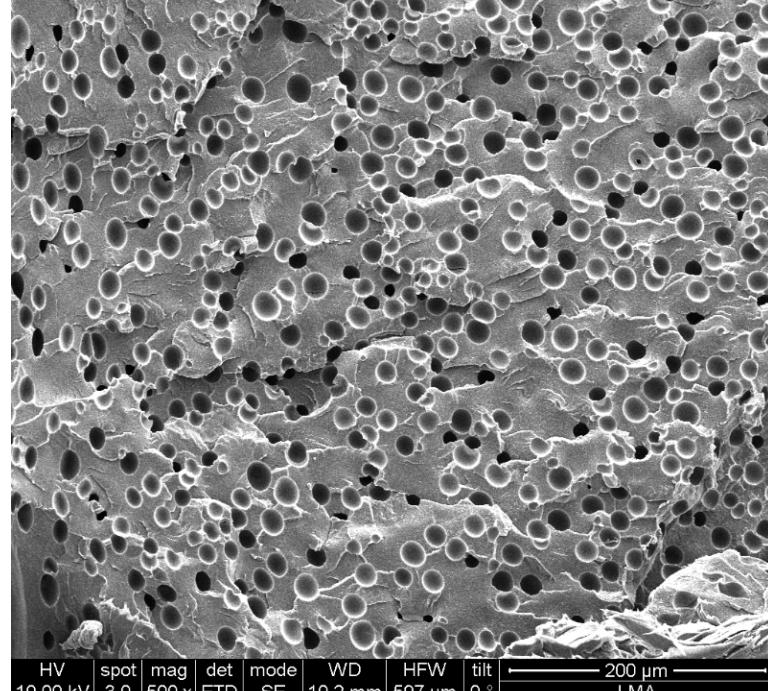
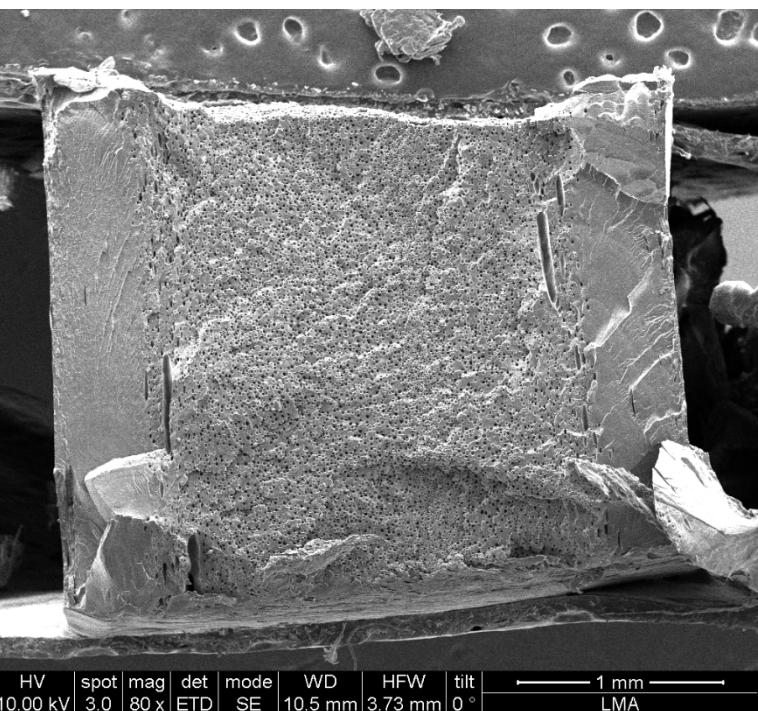
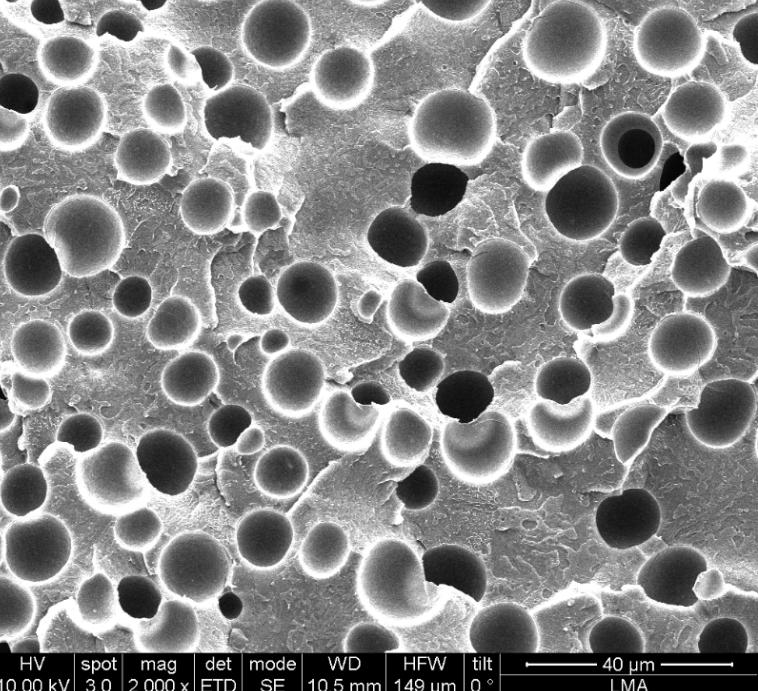


Recycling does not significantly affect the overall tensile behavior of the material, (very ductile behaviors, similar to that of virgin PET)



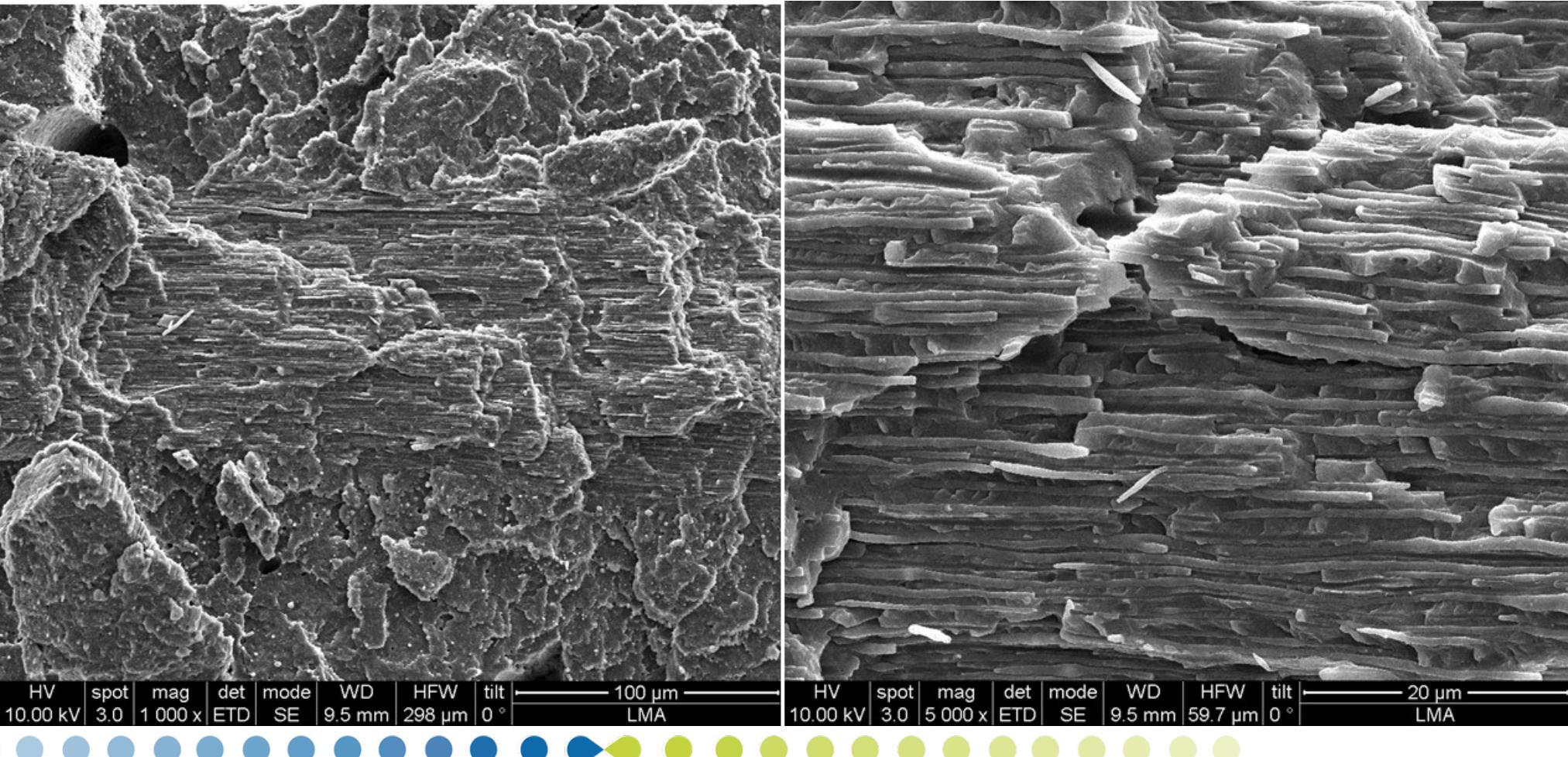
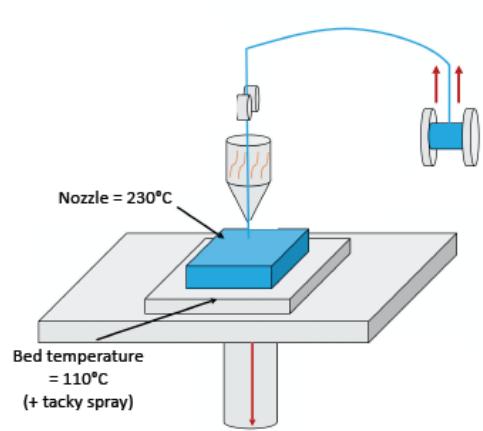
Reactive extrusion improves fatigue properties of r-PET

# Foaming



INMA

## 3D printed microfibrilar blends r-PET/r-PP



Mejorará la economía y calidad del reciclaje de plásticos para establecer mercados viables para el plástico reciclado



Economía Circular

Aumentará el uso sostenible de los residuos plásticos y ampliará el mercado de plástico reciclado a aplicaciones de alto valor añadido

Reval PET UP

## Muchas gracias por vuestra atención

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<https://revalpet.org/es/>

Proyecto cofinanciado por el Fondo Europeo  
de Desarrollo Regional

**Interreg**  
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