Introduction

- Cross-linked polyethylene (PEX) exhibits higher thermal stability, better chemical resistance and improved structural integrity compared to polyethylene (PE).
- BUT, PEX cannot be melted and recycled/reused

AIM

Synthesis of reversibly cross-linked polyethylene: inherently recyclable & sustainable-by-design

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Meet the Team

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REDONDO

Reversibly Designed Cross-linked Polymers

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The project at a glance

01 Synthesis

A. Carbon-dithio reversible bonding

- Cross-linked network based on S-C-S and S-S bonds.
- Stable up to 130 °C and cleavable over 200 °C.

B. Diels-Alder chemistry

- Furan/maleimide complementary functions.
- Cross-linking through Diels-Alder reaction.

02 Green Additives

Biobased additives

- Nanolignin (NL)
- Nanocellulose (NC)
- Chemically modified NL & NC

Properties

- Flame retardancy
- Antioxidant
- Mechanical strength

03 Sustainable & Safe-by-Design

- Life cycle assessments to identify key hotspots for environmental improvement
- Toxicological effects & potential for exposure to health and environmental impact from product inception to end of life
- Development of the **PLACE-me** tool: circular monitoring tool integrating principles of sustainability-by-design along with a holistic value chain assessment

04 Applications

- Processability of newly synthesized rPEX will be evaluated for extrusion.
- Masterbatches will be further formulated
- Two end-users applications:
  - **Pipes** for heating/cooling applications
  - **Cables** for photovoltaic systems

05 Recyclability

- Thermal reversibility of the cross-linking will be assessed.
- Properties of recycled rPEX will be evaluated.
- Recyclability of the final products will be validated.

Communication and Exploitation Activities

- Support the widest diffusion of the project's results to targeted audiences
- Maximise the innovation impacts, contributing to the market uptake of the final products