Desafíos críticos para avanzar hacia la circularidad de los plásticos

Desafío 3: Mercados finales para material reciclado de polipropileno (PP) y poliolefinas mixtas (PP/PE)

a. Descripción general/objetivo

Desarrollar y escalar aplicaciones de mercado para polipropileno reciclado (rPP) y/o mezclas de poliolefinas (PP/PE) que actualmente enfrentan grandes barreras técnicas, económicas y de demanda, especialmente en aplicaciones de mayor valor.

b. Contexto o desafío crítico a resolver

El reciclaje de PP y sus mezclas se ve limitado por la variabilidad del material, la falta de estandarización en formulaciones y la baja demanda de productos reciclados con propiedades estables, especialmente en aplicaciones de contacto con alimentos o de alto rendimiento.

c. Áreas de interés prioritarias

- Tecnologías que permitan combinar distintas resinas conservando propiedades mecánicas y barreras comparables a resinas vírgenes.
- Innovaciones en maquinaria y procesos de llenado que se adapten a calibres variables de materiales reciclados que permitan el uso eficiente de estas resinas como materia prima.
- Soluciones de reciclaje avanzado (por disolución, lavado en seco) que mejoren la calidad del rPP y eliminen olor, color o contaminantes.
- Desarrollo de mercados finales para rPP y poliolefinas mixtas (PP/PE) en aplicaciones rígidas, empaques secundarios o industriales, con trazabilidad y control de calidad.

d. Otras áreas de interés

- Sistemas de reciclaje para PP flexible posconsumo que sean escalables.
- Diseño de productos que integren rPP/rPE de forma estable en sus formulaciones (envases no alimentarios, mobiliario, construcción).

e. Consideraciones generales para las soluciones

Se requiere que las soluciones consideren la compatibilidad con infraestructura local de reciclaje, la disponibilidad de residuos como materia prima. En el caso de poliolefinas mixtas, se valorará que contemplen mecanismos para identificar la proporción de materiales en la mezcla o que demuestren su reciclabilidad e integración en productos de alto valor, independientemente de dicha proporción. **Es clave la validación técnica de las soluciones propuestas, así como su viabilidad comercial y cumplimiento de normativas de calidad (especialmente si se busca contacto alimentario).**

Challenge 2: Enabling the recycling of flexible plastics through design and intermediate technologies

a. Overview / objective

To promote innovation in the design of flexible plastic packaging and products that enable their recycling, prioritizing approaches such as monomateriality, the elimination of non-recyclable components (adhesives, inks, labels) and the use of technologies that facilitate their recovery, classification and processing.

b. Context or Critical Challenge to Be Solved

Many flexible packaging is not recyclable in practice due to multilayer designs or components incompatible with local recycling technologies. In addition, current infrastructure faces barriers to identifying, collecting, and processing these materials. It is necessary to advance in design solutions, such as monomaterials, that demonstrate their effective recyclability in real conditions, including their collection, classification and processing.

c. Priority Areas of Focus

- Mono-material packaging alternatives to facilitate recycling, including sachets, doypacks, bags and films.
- Labels, inks, adhesives, or other components that do not interfere with recycling streams or facilitate processes.
- Replacement of plastic barriers that are not recyclable in practice such as nylon or EVOH in bags and films.

d. Other areas of interest

- Circular solutions for face-to-face events and food courts, incorporating recyclable materials or those that facilitate recyclability.
- Traceability solutions for flexible packaging.
- Logistics solutions for the effective collection of these materials (especially small formats), including return mapping and reverse logistics.
- Sorting technologies that improve the identification and separation of flexible plastics (colour, density, infrared, etc.), reducing time and errors in the process.
- Smart coatings that improve product preservation and facilitate recycling (easy to remove, soluble, etc.).

e. General considerations for solutions

They should consider local recycling infrastructure, avoid difficult-to-separate mixed components, and facilitate material traceability. **Priority is given to solutions that already have functional or pilot tests in comparable contexts, as well as those that integrate eco-design and cost-effectiveness criteria from their conception.**

Challenge 3: End markets for recycled polypropylene (PP) and mixed polyolefins (PP/PE) material

a. Overview/Objective

To develop and scale market applications for recycled polypropylene (rPP) and/or polyolefin blends (PP/PE) that currently face large technical, economic, and demand barriers, especially in higher value applications.

b. Context or Critical Challenge to Be Solved

The recycling of PP and its mixtures is limited by material variability, lack of standardization in formulations, and low demand for recycled products with stable properties, especially in food contact or high-throughput applications.

c. Priority Areas of Focus

- Technologies that allow different resins to be combined while retaining mechanical properties and barriers comparable to virgin resins.
- Innovations in machinery and filling processes that adapt to variable calibers of recycled materials that allow the efficient use of these resins as raw materials.
- Advanced recycling solutions (by dissolution, dry cleaning) that improve the quality of rPP and eliminate odor, color, or contaminants.
- Development of end markets for rPP and mixed polyolefins (PP/PE) in rigid, secondary or industrial packaging applications, with traceability and quality control.

d. Other areas of interest

- Recycling systems for flexible post-consumer PP that are scalable.
- Design of products that integrate rPP/rPE stably in their formulations (non-food packaging, furniture, construction).

e. General considerations for solutions

Solutions are required to consider compatibility with local recycling infrastructure, the availability of waste as raw material. In the case of mixed polyolefins, it will be valued that they include mechanisms to identify the proportion of materials in the mixture or that they demonstrate their recyclability and integration into high-value products, regardless of this proportion. **The technical validation of the proposed solutions is**

key, as well as their commercial viability and compliance with quality regulations (especially if food contact is sought).