**Project acronym:** BeFORE – Barrier for recycling

**Project title:** Recyclable material innovations for ’contact sensitive’ plastic and paper packaging with high quality barrier properties

**PROJECT SCOPE**

**Need and problem**

Multilayer plastic and paper packaging play a key role in protecting sensitive products during shelf life. However, high-barrier packaging materials as complex multi-material structures (Alu; met; PVDC; EVOH; PVAL; PA) are excluded from the mechanical recycling path and/or may hinder the recycling of other materials in waste streams. Sorting and mechanical recycling are primary processes to valorise used packaging. While chemical recycling is evolving quickly and will become increasingly important in coming years, it is currently not economical and is not widely accepted. With the European demand to have all packaging reusable or recyclable by 2030, material selection is focused on mono-materials. Recommendations on refusing or limiting metal and polymer barrier layers are critical to qualify packaging as single-material, sortable and recyclable with available technologies. These assumptions lead to the supply of quality secondary materials for circular applications. Limiting the use of these essential barrier materials in packaging puts pressure on the functionality of the barrier, creating a need for other high-quality barrier materials that are regaining interest and newly developed, to comply with current recycling guidelines.

This allows to change the paradigm of multi-layer packaging with a barrier layer inside the structure and evolve towards packaging with thin functional coatings fulfilling barrier requirements. "Barrier" is an umbrella term, multiple factors are included: gas (oxygen, carbon dioxide, volatile compounds (e.g. aroma, fragrance) or other gases), moisture, liquid (water, oil, acid) and light/UV transmission.

Other barrier coated materials, such asAlOx- based, PEN, LCP or organic-inorganic hybrid barrier structures could serve as a solution. Also new materials are being developed and show promising first results. However, optimizing and validating these materials for packaging concepts is needed in the sectors of food, petfood and cosmetics, who are the main users of multilayer packaging.

**Innovation target**

The main goal of this project is to **improve design for recycling of primary packaging** by studying the implementation potential of promising flexible packaging materials with alternative barrier materials. The creation of well-performing plastic and paper packaging, considered as mono-material, is encouraged to ensure good mechanical recycling. In this context, pre-treatments that can be implemented in mechanical recycling will be taken into account, such as deinking and washing. Groups of key parameters have been selected to measure technical aspects of product protection and packaging recyclability: static and dynamic mechanical properties, barrier properties and the sensory quality of the product, sealability, compatibility with automatic packaging systems and recyclability in existing streams. Economic feasibility and market availability will be considered in the assessment.

Three categories of products were selected for the research: food, pet food and cosmetics. Each category includes dry and moist products with different water/fat content and different storage characteristics. The physical and chemical structure of the product will constitute the test selection criteria.

**Product type and packaging benchmark**

|  |  |  |
| --- | --- | --- |
| Food | Petfood | Cosmetics |
| Dry food: coffee  Benchmark: PET/Alu/PE (X µm)  Requirements: OTR, WVTR, aroma | Dry and fatty: pelleted food, snacks  Benchmark: bag up to 10 kg  Requirements: OTR, WVTR, aroma | - |
| acidic food pH < 4,5 (like fruit juice, ketchup)  Benchmark: structure (X µm)  Requirements: OTR, WVTR, water | Wet food:  Benchmark: sachets  Requirements: OTR, WVTR, aroma | Liquid, water-based: liquid soap  Benchmark: refill doypack; structure (X µm)  Requirements: OTR, WVTR, light |
| Fatty foods (like cheese, feta, mayonnaise)  Benchmark: structure (X µm)  Requirements: OTR, WVTR, grease |  | Liquid, oil-in-water emulsion: cream  Benchmark: structure (X µm)  Requirements: |
| Chilled and frozen food: vegetables |  | Other cosmetic products: wet wipes  Benchmark: sachets; structure (X µm)  Requirements: WVT |

**Goals**

To reach the innovation target, following sub-goals will be targeted;

* Alternative barrier materials are inventoried in the beginning and during the project + compliance is assessed with European legislation/new developments, with respect to paper packaging and single-use plastics
* Promising flexible packaging with alternative barrier materials will be screened and benchmarked against existing solutions
* 5 generic (3 plastic and 2 paper) packaging case studies will be defined in cooperation with the guidance group companies (e.g. coffee, tea, dry pet food, chocolate, meat, wet wipes, liquid soaps,…) where multilayer packaging is replaced with a promising alternative barrier packaging
* Promising barrier materials are applied on lab-scale plastic and paper packaging to assess relevant properties linked with the cases:
  + Barrier properties: OTR, WVTR, grease/oil and light transmission,…
  + Mechanical properties: crack-resistance (bendability), adhesion, strength, tear, puncture, friction , packaging line compatibility,…
  + Chemical surface properties: sealability, printability,…
* For these case studies, the functional packaging properties (e.g. overall migration, sensory analysis, aroma permeability,…) are assessed
* Mechanical recyclability is tested according to the most recent recycling guidelines
* Assess how to be compliant with legislation on paper packaging and single-use plastics on the European market
* Strategic dissemination and communication are focussed on the companies in the value chain for accelerated uptake of project results; dissemination of results through scientific, peer-reviewed publications and presentation of research results for business.

**Industry focus**

The project will focus on the **food, pet food and cosmetics** (as they follow the food guidelines due to lack of own standards) industry. Companies in the guidance group for the value chain for coated packaging consists of material supplier, converter, packaging producer, food manufacturer as the packaging demands are defined by the food manufacturer based on the demands from the retailers, customers and legislation.

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| --- | --- | --- | --- | --- |
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**Company information, needed for TETRA administration**

|  |  |
| --- | --- |
| Organization |  |
| VAT. and address |  |
| Flemish SME? | Y/N (if not, add type of organization) |
| Name and function  contact person |  |
| Phone |  |
| e-mail |  |

After approval of the project application, the above-mentioned company is willing to contribute financially, based on the table below.

|  |  |
| --- | --- |
| **Company size (number of employees)** | **Total project cost** |
| Small: 1 - 50 | €1200 |
| Medium: 50 – 250 | €2400 |
| Large: > 250 | €4500 |

The undersigned declares to be aware of the content of the project proposal entitled

**BeFORE-Barrier for recycling: Recyclable material innovations for ’contact sensitive’ plastic and paper packaging with high quality barrier properties**

which will be submitted in the framework of the Joint CORNET Call to the following funding agencies:

* AiF, German Federation of lndustrial Research Associations, Cologne Germany (agency of coordinating partner IVLV)
* NCBR, National Centre for Research and Development, Warsaw Poland (agency of association Natureef)
* VLAIO, Flanders Innovation & Entrepreneurship, Flemish organisation, Brussels Belgium (agency of association UHasselt/MPR&S imo/imomec, Sirris, Pack4Food & Flanders’ FOOD)

The proposed project is of interest to the business of for the following reasons:

After approval of the project application, the above mentioned company is willing to be member of the user committee, to participate in the project and to make clear arrangements in the bylaws of the user committee. The above mentioned company will delegate an active member to the user committee, which includes participation in two or three Users Committee meetings per project year.

The above mentioned company acknowledges that they will not be a formal member of the project consortium, that the intellectual property rights belong to the project applicants, and that membership of the users committee does not include any priority rights to the intellectual property. The research in this collective research project is done by research institutes (non-profit organisations).

The above mentioned company will provide information and feedback to the project consortium to enhance efficiency, focus and direction of the project.