

## **Abstract CoRe<sup>2</sup>-2**

**Circular use of step-growth end-of-life polymers for monomer/oligomer recovery and reuse II**, full cSBO with a proposed starting date on 1 January 2022 and a proposed duration of 30-48 months, with research partners KU Leuven, UHasselt and UGent. Follow-up project of the currently running Moonshot sprint cSBO project CoRe<sup>2</sup> (<https://moonshotflanders.be/mot2-core2/>).

CoRe<sup>2</sup> aims at inventive chemical processes to revalorize waste fractions containing **polyamides, polycarbonates and polyesters**. **Chemolytic routes** providing controlled **polymer splitting** to chemical building blocks are highly preferred over physical recycling options, especially when most waste streams are impure or collected as polymer blends or inseparable layered materials. The 18 M pre-phase of the project has already revealed strong leads for (i) *selective dissociation* of polyesters, polycarbonates and polyamides in polymer blends into their monomers, (ii) the catalytic conversion of splitting products (e.g. aliphatic amides from polyamides, e.g. bisphenols from polycarbonate) to high-value *diamines*, and (iii) the upcycling of end-of-life PET to high-performance *thermoplastic co-polyesters (TPCs)*.

Based on these lead findings, CoRe<sup>2</sup> will strongly expand the fraction of polyesters, polycarbonates and polyamides that can be recycled to high-value monomers or polymers, and this at low temperatures (< 150°C) and reaction times (< 1 hr). A chief target is the selective **upcycling of polyesters** from **mixed fiber waste**, in particular **textiles**, as well as **full chemical recycling options for physically inseparable polyester-polycarbonate-polyamide mixtures**. A **portfolio of catalytic methods** will be designed to produce valuable linear aliphatic, cycloaliphatic or aromatic **diamines**. Re-using the obtained monomers, and integrating building blocks gained through chemcycling, we will design **high-performance polymers** like TPCs and polyphthalamides. New **kinetic algorithms** will be developed as tools for controlling and steering de/re-polymerisation in an industrial context, facilitating the take-up at higher TRL level.

The project results can be directly valorized by

- **waste recycling companies**: they can implement the innovative upcycling routes proposed for polyesters (other than bottle PET), polyamides, polycarbonates, etc, especially for **physically inseparable mixtures**;
- **polyurethane producers, polyamide producers**: they can use the diamines that are sourced from waste feedstocks rather than from virgin fossil feeds; also **amine manufacturers** can benefit;
- **textile companies**: we hand them concepts to produce / use fibers that are designed for recycling;
- **(co)polyester/(co)polyamide manufacturers**: they can produce thermoplastic copolyesters and polyphthalamides using a range of recycled monomers;
- polymer producing companies aiming at software for kinetic and process control.

*For substantive questions about this project proposal, please contact MOT2 representative Wannes Libbrecht ([wlibbrecht@catalisti.be](mailto:wlibbrecht@catalisti.be); +32 499 315 604).*