Request for Knowledge Partners (25 October 2022)

Project title: Dissolution recycling, rejuvenation and reuse of PVC waste in vinyl floorings

Acronym: DISSOLV

Project ID	
Type	ICON
Period	2 years
Starting date	TBD
Total project budget	TBD
Subsidy percentage	according to SBO and O&O regulations
Current industrial partners	confidential
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Project description

Introduction

EU legislation sets mandatory recycling rates (50% and 55% by 2025 and 2030, respectively) and plans to include a mandatory recycled content target (30% by 2030) for plastic packaging to create a more sustainable circular economy in Europe [European Commission]. Flemish legislation pushes towards a more circular use of plastics as well [Vlarema 8]. While plastic waste streams hold an enormous recycling potential, currently, only a minor fraction of plastic waste is valorized. In 2020, less than 40% of the post-consumer plastic waste in Belgium was sent to recycling while almost 60% was incinerated for energy recovery [PlasticsEurope, 2022].

Since there is no “silver bullet” solution to significantly reduce waste disposal and GHG emissions, upstream (i.e. pre-consumer) and downstream (i.e. post-consumer) solutions are complementary and are most effective when deployed together [Systemiq, 2022]. Dissolution recycling, among others, is expected to become an enabling downstream technology to increase the recycling rate of numerous plastic waste streams and to further close the loop. In particular, dissolution recycling can ameliorate some of the inherent negative characteristics of mechanical recycling, such as polymer degradation and product quality and purity.

So-called “legacy additives” include previously used hazardous chemicals (e.g., plasticizers, fire retardants) that are now declared as “substances of very high concern” (SVHCs) [ECHA] or as “persistent organic pollutants” (POPs) [UN Stockholm Convention]. The hazard posed by SVHCs/POPs is being addressed by strict international regulations such as EU REACH. These regulations aim to phase out and prevent the recirculation of SVHCs/POPs in commercial trade to protect human health and environment from further contamination. Accordingly, plastics that contain SVHCs/POPs should be phased out and destroyed or, alternatively, remediated.

In short, driven by sustainability, a clear need exist to develop innovative downstream technology that can efficiently recycle plastic waste while safely dealing with legacy additives, which is crucial to establish a truly sustainable circular economy of plastics. In this regard, dissolution recycling seems to be a promising technology.

Goals

In general, the DISSOLV project attempts to rejuvenate and recycle, and reuse PVC waste streams in cushion vinyl flooring applications by dissolution technology. More specifically, the proposed project aims to increase the recycled content in cushion vinyl flooring by replacing one or more virgin constituents with recycled alternative(s) that are devoid of harmful legacy components. Cushion vinyl flooring mainly

consists of PVC, plasticizers and filler material but also minor amounts of additives and glass and/or polyester (backing) are present. PVC waste streams can originate from end-of-life flooring as well as other PVC waste (e.g., tarpaulins, artificial leather, medical devices).

Innovative dissolution technology will be developed that is capable to treat selected PVC waste streams, to extract recyclable constituents and to separate harmful legacy additives and other constituents (e.g. DEHP, organo-Sn, Pb, Zn, Cd and Ba salts). Since the composition is extremely important to achieve the desired properties of cushion vinyl flooring, the effect of different plasticized PVC waste streams will also be evaluated. Separation and purification of recovered valuable plasticizer will also be an important task within the project.

Tentative project outline:

- Part 1: Identification and characterization of PVC waste streams using advanced analytical techniques (e.g. FTIR, GPC, ICP-AES, XRF, etc.)
- Part 2: Selective dissolution recycling of PVC waste streams into valuable recyclable constituents
  - Pre-treatment: cleaning, grinding, and mixing
  - Treatment: dissolution, filtration, precipitation, distillation and drying
- Part 3: Advanced separation of all components of PVC waste streams
  - Separate PVC in a usable physical form
  - Separate plasticizer in a usable physical form
  - Separate, purify and/or post-treat (legacy) additives
- Part 4: Recyclate(s) reuse and evaluation in vinyl flooring applications.

The proposed project contributes to establish a sustainable closed-loop recycling of cushion vinyl floorings.

Request

With this Request for Partners, we would like to invite universities / knowledge institutes that have expertise, technology or knowledge relevant to the project to respond to this request for expertise / partners. **To reach the project goals, the consortium is particularly searching for the following (non-limitative) expertise:**

- Lab- and/or pilot-scale equipment/technology to purify and post-treat recyclable constituents, e.g. plasticizers, fillers, etc.
- Fundamental knowledge and expertise on re-additivation of PVC.
- Fundamental knowledge and expertise on analytical techniques and polymer architecture.

How to reply to this request

Please send your **proposal by email** to Catalisti **at the latest by November 15**, **exclusively via your association representative** (see contact list below). An application (2-3 pages without attachments) should contain at least the following items:

1. Organisation and research group
2. Name and contact details of person submitting the proposal
3. Name and contact details of person(s) who will perform the actual tasks (if different from submitting person)
4. A proposal of your role in the project: for which expertise/assignments described above do you apply?

   Provide a concrete proposal on:
   - how you want to contribute to the required expertise/assignments and how you want to solve the (research) problem described above
   - how this fits in the (long-term) ambition of the research group/knowledge institute

   If you consider your contribution to fit within fundamental basic research (SBO), please provide argumentation.
5. A description of your expertise/track record/experience in the specific topic of this RfP, for which you are applying (at the 3 organisational levels as mentioned above, i.e. for the organisation

and/or research group, for the person submitting the proposal, as well as for the executing person(s)) (preferably give the resumes of submitting and executing persons attached)
6. A list of relevant funded projects (Catalisti, VLAIO, EU, …) where you were a coordinator or partner
7. A commitment to prepare a full project proposal by Q1-2023 together with the other project partners.

Please contact your association representative for more details on how to write your application.

Contact List

- KU Leuven: Bert Lagrain (bert.lagrain@kuleuven.be);
- UAntwerpen: Ann Aerts (annfb.aerts@uantwerpen.be);
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- IMEC: Kris Van De Voorde (kris.vandevoorde@imec.be);
- VKI: Peter Simkens (peter.simkens@vki.ac.be).

Evaluation

The industrial partners, together with Catalisti, will review all proposals obtained before the deadline mentioned above. The industrial partners will make a selection of the best proposals based on the following criteria:

- your expertise in the requested expertise domain (5pt)
- your experience in carrying out similar assignments (3pt)
- your experience in other relevant funded projects as a coordinator or partner (3pt)
- complementarity with the other executing project partners (4pt)

After submission of your proposal, you can be contacted by telephone or invited to an online or live meeting (if this is deemed necessary by the industrial partners) to further elaborate your offer. *Please note that the selection will be made primarily based on your written proposal, so be complete and thorough, without anticipating on a further elaboration of your proposal.*

The final decision will be communicated typically within 2 weeks after the deadline mentioned above, but could take longer depending on the number of proposals and selection of a balanced project consortium.

Contact

Please contact Stef Koelewijn (skoelewijn@catalisti.be, +32 487 67 20 77) with Kathleen Smolders (ksmolders@catalisti.be, +32 499 25 82 08) in CC for any questions you might have related to this RfP or the Catalisti procedures in general.
