In a Nutshell

CUBIC presents an innovative solution to improve the sustainability and circularity of complex products made of high-tech advanced multi-material composite structures, by developing novel biomaterials. The ultimate goal is to develop 100% circular by design biobased and recyclable thermoplastic and thermoset B2B intermediate products.

Products and services

- Three (3) 100% biobased materials as building blocks for the B2B intermediate formats: biobased polyamide grades (bioPA), biobased endured 3R-CAN epoxy system, biobased lignin derived carbon fibre (bioCF).
- Seven (7) new circular by design biobased thermoplastic and thermoset B2B intermediate semi-finished products: bioPA pellets, bioPA micronised powder, self-reinforced bioPA filaments/yarns, bioPA UD-tapes, bioPA organosheets, bioCF endured filaments, bioCF UD-tapes.
- Two (2) end-products to validate the circular by design approach and to test their environmental and technical requirements: (i) hyrdrogen gas (H2) storage pressure vessel, and (ii) automotive seat.
- New de-manufacturing proccess to ensure recyclability and valorisation of the products' circularity.
- Two (2) training programmes for industrial actors and young researchers on circular economy and smart & green manufacturing practices.

Identity

Project title:
Improving the circularity of complex plastic multi-material composites using novel biobased materials in B2B semi-finished products.

Grant Agreement No: 101111996
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Find Out More

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Contact us: info@cubicproject.eu

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Project partners

FUNDACION AITIIP
Research & Technology Organisation
https://www.aitiip.com/
Spain

SPECIFIC POLYMERS
Industrial Developer
https://specificpolymers.com/
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Research & Technology Organisation
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Improving the circularity of complex plastic multi-material composites using novel biobased materials in B2B semi-finished products

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CUBIC
NOVEL BIOBASED MATERIALS TO IMPROVE CIRCULARITY

Aim

The CUBIC project develops and demonstrates novel biobased materials, 100% recyclable by design, which will be manufactured as B2B intermediate semi-finished products. They can be used either individually or assembled in the final end-user product in order to replace current complex thermoplastic and thermoset structures. The overall objective of these new bioproducts is to provide an alternative biobased solution to the manufacturing industry by boosting green and digital transformation.

Project Goals

- **Develop and validate three (3) 100% biobased materials as building blocks to produce B2B intermediate formats.**
- **Develop and validate at least seven (7) new circular by design biobased B2B intermediate semi-finished products.**
- **Combine and integrate the B2B intermediates in order to demonstrate the circular-by-design approach into two (2) end-products or specific applications.**
- **Demonstrate the CUBIC solution in two (2) value chains of complex plastic products (thermoplastics and thermosets).**
- **Diversify the potential of the B2B intermediates in at least three (3) other applications and sectors.**
- **Demonstrate product circularity by validating their de-manufacturing process, recyclability and valorisation.**
- **Assess the environmental, social & ethical and costs impacts associated with the novel products within a Life Cycle approach.**
- **Increase CUBIC material performance (>10%) by applying Artificial Intelligence.**
- **Develop an exploitation & IPR strategy for Key Exploitable Results.**
- **Develop a Business Plan to demonstrate the commercial potential of the developed solution and describe how this potential will be realised.**
- **Inform, promote, communicate and disseminate the project objectives, activities and results; engage stakeholders to create synergies.**
- **Provide new knowledge and skills to industry, young scientists and engineers.**

Stakeholders

The CUBIC project covers the whole composites value chain by taking into account, apart from the consortium partners, interaction with other projects of Biobased Industries through synergies, communication and dissemination activities:

- Industrial developers across the entire value chain, including biobased material producers, technology uptakers, plastic product developers, recyclers and waste managers.
- Research & Scientific communities, including Universities, Research Institutes, Technological Centers, Scientific Forums.
- Investors and Financial actors, such as Horizon Results Platform, European Bank for Reconstruction and Development (EBRD), European Circular Bioeconomy Fund (ECBF), European Investment Bank (EIB).
- Policy makers, sectorial working groups & associations, standardisation bodies.
- Wider audience, including NGOs, civil organisations, customers, European citizens.

Project Phases

CUBIC
NOVEL BIOBASED MATERIALS TO IMPROVE CIRCULARITY

Phase 1: NOVEL BIOBASED MATERIALS	Phase 2: INTERMEDIATE B2B BIOBASED SEMI-FINISHED PRODUCTS	Phase 3: CIRCULAR-BY-DESIGN NOVEL BIOBASED COMPLEX PRODUCTS AND PROCESSES	Phase 4: SUSTAINABILITY AND DIGITALISATION	Phase 5: COMMERCIAL EXPLOITATION
Three different biobased materials as building blocks	B2B biobased intermediates: powder, pellets, filaments, sheets, UD-tapes	Validation of two end-user demonstration products: hydrogen gas vessel, automotive seat	Safe and Sustainable by Design (SSbD) principles	IPR management
Materials design optimisation	Optimisation of the manufacturing technologies	Circular design for de-manufacturing, recycling and valorisation	Life Cycle Sustainability Assessment (LCSA)	Exploitation Strategy
Upscaling best biobased materials	Characterisation of B2B semi-finished products	Replication potential of B2B intermediates for further applications	Digital tools for process materials modelling and optimisation	Sustainable business modelling & planning

Phase 6: COMMUNICATION, DISSEMINATION AND TRAINING

Communication, dissemination and training plan	Communication campaign and dissemination actions	Stakeholders' engagement, creating synergies	Training of scientists and industrial professionals

Benefits

- **Improved circularity and sustainability of multi-material composites, leading to reduced environmental impact, combined with higher cost-effectiveness and increased profitability.**
- **Mimimised use of primary hydrocarbon composite materials to reduce landfilling at their end-of-life by replacing them with biobased alternatives.**
- **New knowledge for the European Industry on the biobased circular economy of composite materials (thermoplastic and thermosets).**
- **New knowledge and skills for industrial actors and young researchers in material science, engineering and chemical fields, for new arising demand in technical jobs.**
- **Increased jobs and turnover by promoting new bioproducts in at least two (2) industrial applications:**
  - **Hydrogen gas storage**
  - **Automotive sector**