

URCA, A KEY PLAYER IN THE DEVELOPMENT OF BIOBASED MATERIALS

THE UNIVERSITY OF REIMS CHAMPAGNE-ARDENNE

has recognized skills and know-how that are essential for the development of **innovative biobased materials**. Our technical means and scientific skills in the domain of biobased materials enable us to meet specific performance expectations such as resistance, durability, biodegradability, insulation, multifunctionality, lightness, recyclability, required by players in many markets.

From biomass expertise to product application



Use

- Usability testing in real conditions: packaging, wrapping, composites, construction materials

Implementation

- Development, formulation and implementation (extrusion, surface treatment) of composite materials
- Synthesis of monomers derived from agro-resources
- Modification of natural and biobased polymers
- Polymerisation, crosslinking and radiation grafting
- Development of clean pre-treatment processes
- Encapsulation, protective and functional coatings
- Design of nanomaterials
- Additive manufacturing
- Development of long-fibre composites

Pre-treatment

- Techniques of defibration, extraction, purification, enzymatic fractionation

Characterisation – Modelling – Processes

- Optimisation of the triptych structures / processes / properties
- Characterisation of composites, polymers, nanomaterials, yarns and technical reinforcements
- Evaluation of materials performance (resistance, durability, biodegradability, etc.)
- Modelling of materials behaviour
- Formulation and functionalisation of materials

4 MAIN RESEARCH AREAS


- Development and characterisation of biobased composite materials
- Synthesis and characterisation of biobased polymers (thermoplastics, thermosets)
- Development and characterisation of nanomaterials
- Control and optimisation of implementation processes

KEY FIGURES

 **40** Researchers and teacher-researchers

 **+ than 10** patents

+ than 30 industrial collaborations 

 **5** European projects obtained in the past 5 years

4 laboratories * 

For applications in


Construction industry


Viticulture


Packaging


Healthcare


Transport


Textiles


Electrical engineering

* UMR 614 URCA/INRAE Fractionnement des Agro-Ressources et Environnement (FARE)
UMR 7312 URCA/CNRS Institut de Chimie Moléculaire de Reims (ICMR)
EA 4682 Laboratoire de Recherche en Nanosciences (LRN)
EA 7548 Institut de Thermique, Mécanique, Matériaux (ITheMM)

State-of-the-art equipment at the service of our researchers and industry network



Pre-treatment equipment

- Mechanical
- Chemical
- Biological
- Retting in the field



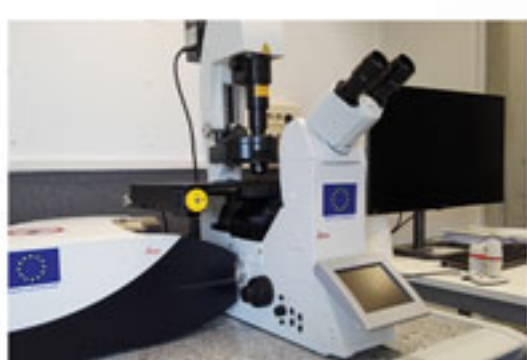
Implementation

- Single screw microextruder
- Twin-screw extruder
- Electron accelerator
- UV sources
- Thermoformer
- Liquid process (infusion)
- 3D printers
- Injection moulding machines



Use

- Wrapping and packaging unit
- PLCs and industrial robots



Multi-scale characterisation equipment for fibres, yarns, reinforcements and materials

- Physical, Chemical, Hydric, Thermal, Morphological, Spectral, Optical, Acoustic, Mechanical

Some publications

- Scida, D. *et al.* Hygrothermal/UV Aging Effect on Visual Aspect and Mechanical Properties of Non-Woven Natural-Fiber Composites. *Journal of Renewable Materials* 7, 865–875 (2019).
- Berzin, F. *et al.* Influence of the polarity of the matrix on the breakage mechanisms of lignocellulosic fibers during twin-screw extrusion. *Polymer Composites* 41, 1106–1117 (2020).
- Tataru, G. *et al.* Modification of flax fiber fabrics by radiation grafting: Application to epoxy thermosets and potentialities for silicone-natural fibers composites. *Radiation Physics and Chemistry* 170, 108663 (2020).
- Chabbert, B. *et al.* Multimodal assessment of flax dew retting and its functional impact on fibers and natural fiber composites. *Industrial Crops and Products* 148, 112255 (2020).
- Furtak-Wrona, K. *et al.* Polyurethane acrylate networks including cellulose nanocrystals: a comparison between UV and EB- curing. *Radiation Physics and Chemistry* 142, 94–99 (2018).

Quality training courses

Initial training

Are you looking for future collaborators? Do you wish to complete your studies? A wide range of quality training courses provided at URCA, at the Ecole Supérieure d'ingénieurs de Reims (ESIREims) and at the École d'ingénieurs en Sciences Industrielles et Numérique (ESiNe) focus on biobased materials.

To find out more: www.univ-reims.fr

Formation professionnelle

Does your structure / company wish to support its employees by training them in the use or characterisation of biobased materials? Our experts can help you. URCA's vocational training department is ready to meet with you to study your needs and offer you the most appropriate training solution.

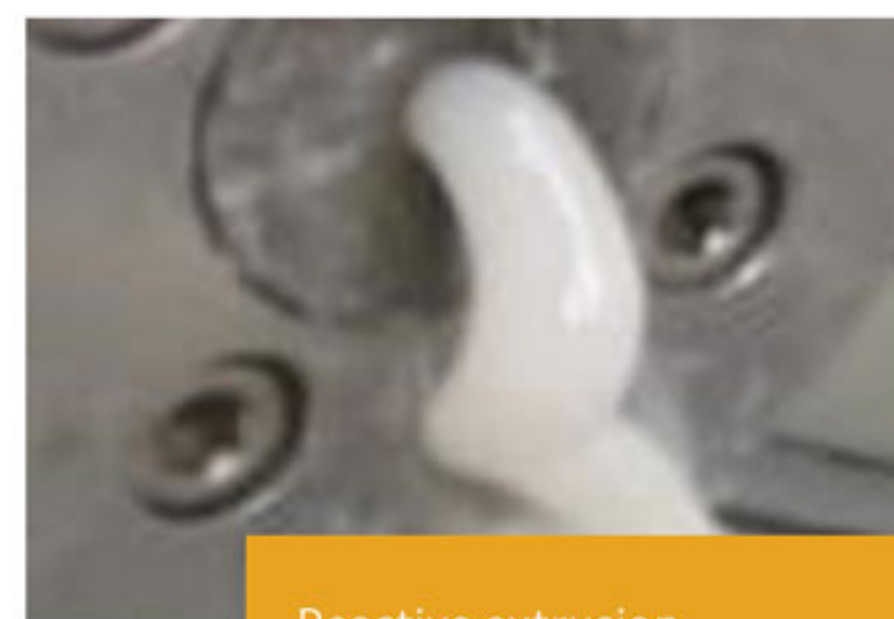
To find out more: dfpa@univ-reims.fr

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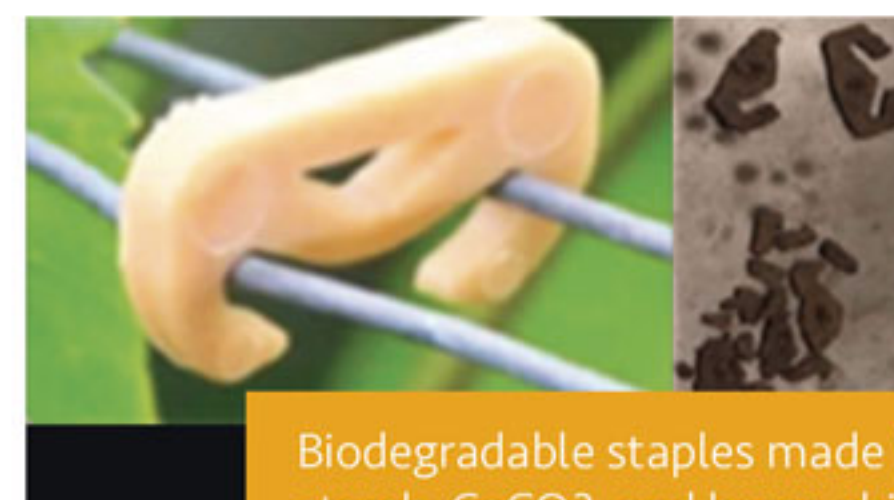
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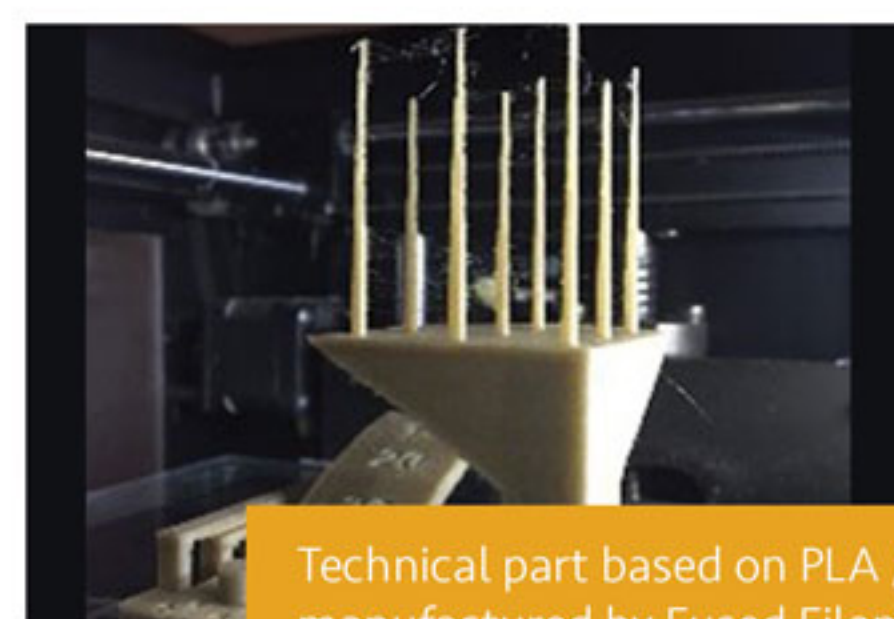
Hempcrete



Reactive extrusion



Biodegradable staples made from starch, CaCO₃, and hemp shives (Degradability <1 year)



Technical part based on PLA / Flax manufactured by Fused Filament Fabrication (FFF)

