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NOVEL BIOBASED MATERIALS TO IMPROVE CIRCULARITY

Biobased polyamide multifilament yarns

Melt-spun yarns for self-reinforced composite applications

Circular Bio-based Europe Joint Undertaking

Bio-based Industries Consortium

Co-funded by the European Union

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The problem that solves

- Conventional composite systems often combine different fibre and matrix chemistries, making recycling and end-of-life recovery difficult.

- Self-reinforced composites require yarns with stable melt spinning, suitable mechanical properties and a sufficient thermal processing window between matrix and reinforcement fibre.



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Unique properties and innovation

- Commerical and CUBIC-developed bioPA grades screened from lab to pilot-scale.
- Low and high-melting bioPA grades melt-spun to multifilaments with function of matrix and reinforcement in the composite.
- FDY, POY and drawing/relaxation routes used to tune tenacity, shrinkage and processability.
- Spinning feedback supported material reformulation and improved filament stability.



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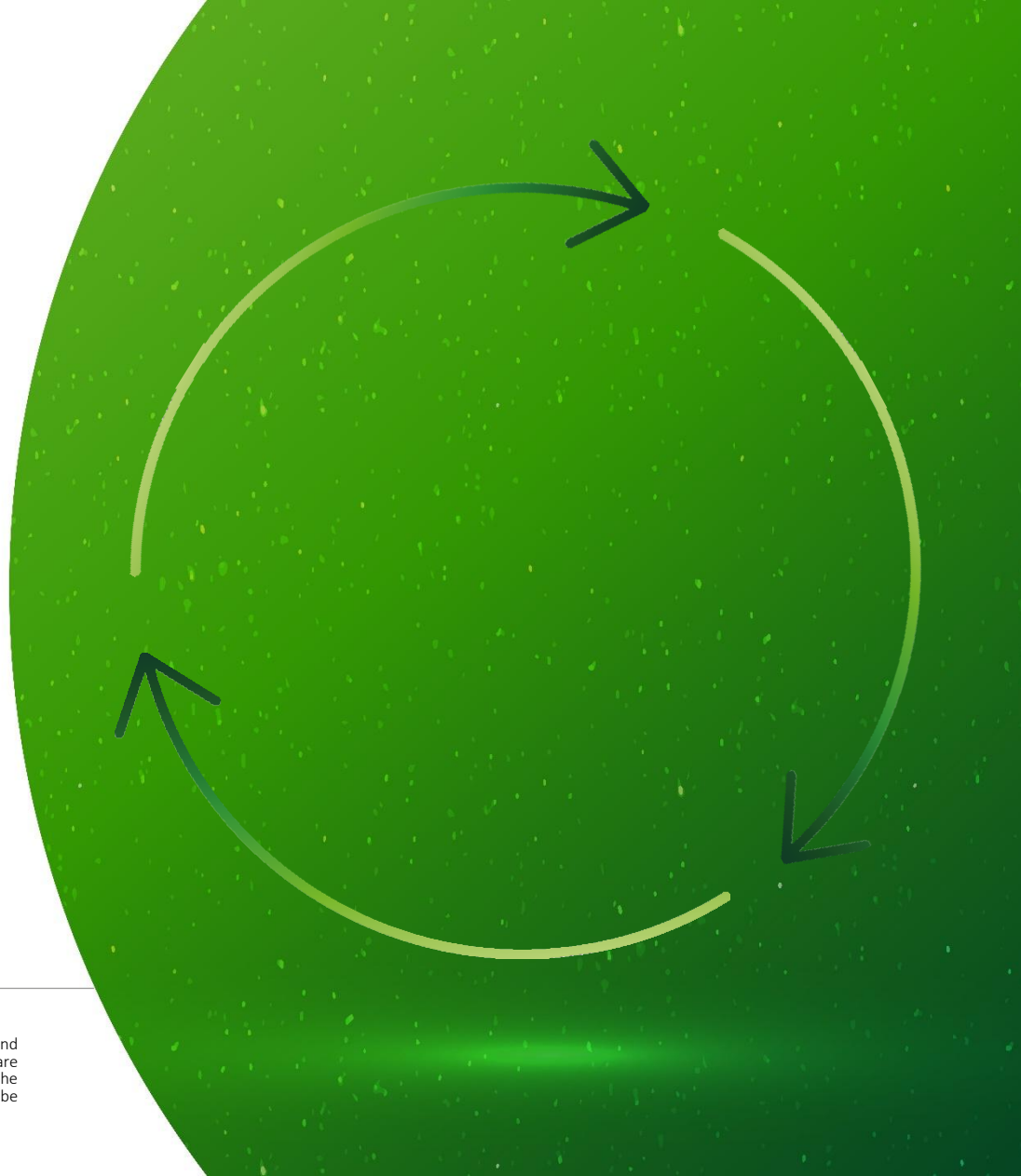
Main benefits

- Scalable melt-spinning route from small-batch bioPA screening to kg-scale pilot production.
- bioPA yarns compatible with composite processing.
- Processing route can be adapted to either matrix or reinforcement function.
- Material formulation, spinning behaviour and final yarn properties are linked in one iterative development route.



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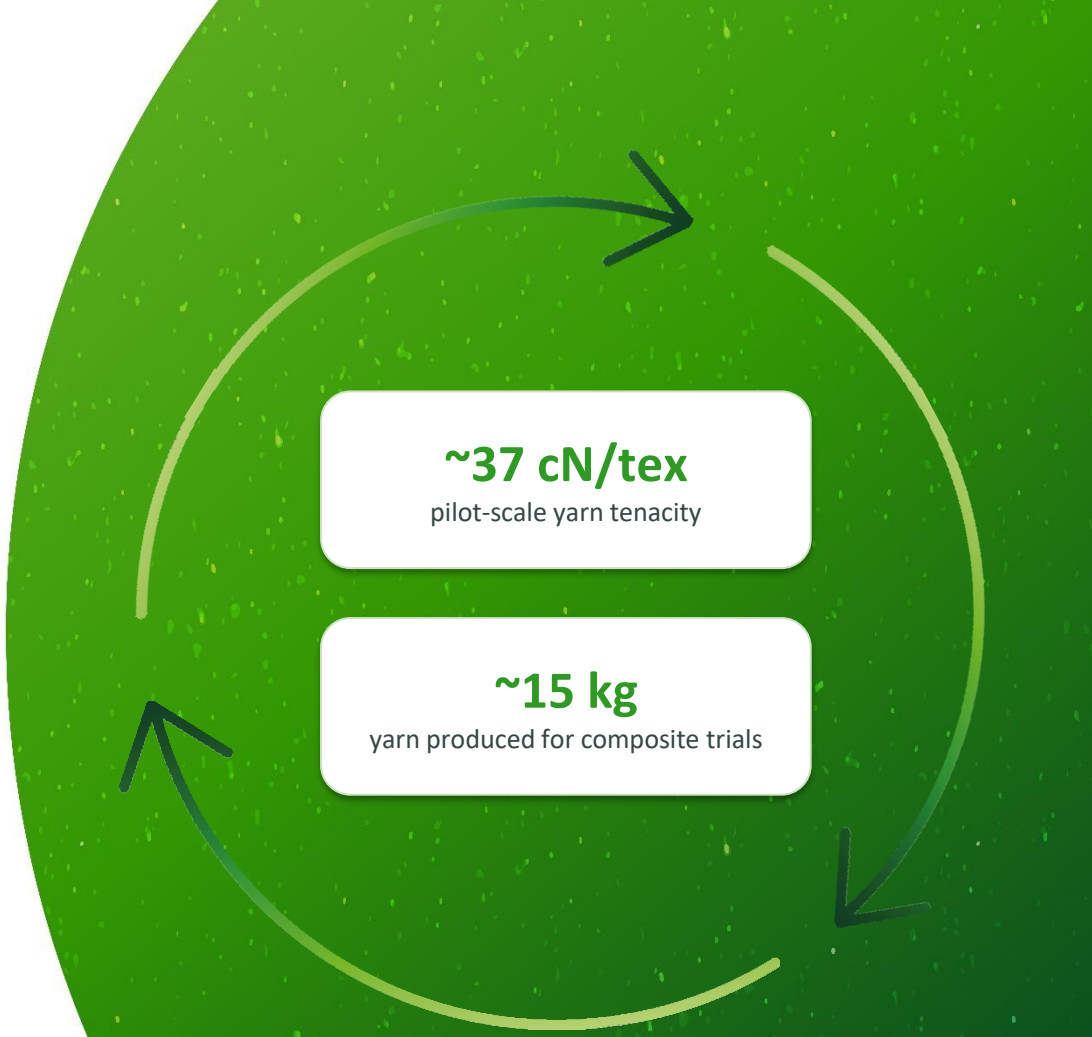
Demonstrated impact

- Stable continuous multifilament yarns obtained from optimized bioPA grades.
- CUBIC-developed bioPA yarns reached up to 37 cN/tex tenacity.
- Approximately 15 kg of bioPA yarns was delivered for downstream composite processing.
- Shrinkage studies quantified the trade-off between dimensional stability and yarn strength.



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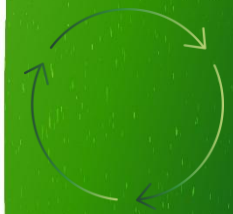
Unique selling points

- Bio-based PA multifilaments
- Lab-to-pilot scale-up capability
- Tailored FDY/POY and shrinkage-control strategies

Potential applications, industries

- Self-reinforced thermoplastic composite structures
- Hybrid yarns and organosheet preforms
- Transfer potential to other transport and sports composite applications



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Outcomes

- Processing windows established for several bioPA grades.
- Promising CUBIC-developed bioPAs successfully converted into continuous multifilaments.
- Pilot-scale quantities supplied for downstream composite manufacturing.
- Filament processing and shrinkage-control know-how transferred to the organosheet and demonstrator activities.



Example of produced bioPA multifilament yarn

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