

Next Generation Cellulosic Filaments from Hemp - HighPerCell[®] meets Iroony[®]

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DITF Denkendorf

German Institutes of Textile and Fibre Research

- Founded in 1921
- Foundation under public law under the supervision of the Baden-Württemberg Ministry of Economics, Labor and Housing foundation
- Application oriented research from molecule to product
- Research with industrial pilot facilities, focus on technical textiles and life sciences



Competence Center Biopolymer Materials

Biopolymers

Establishment of new Approaches



Renewable Resources

- Sustainable raw materials like cellulose, chitin, keratin, alginate
- Smart, recyclable solvents

HighPerCell® Process

Flexible Spinning Techniques



Biopolymer Processing

- Biopolymer fibres for textile and technical
- Foils and coatings

Product Development

Application



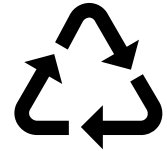
Innovation and Sustainability

- Reinforcement for composites
- Carbon fibres from cellulose
- Textile applications

HighPerCell® technology – Spinning of Cellulose Filaments

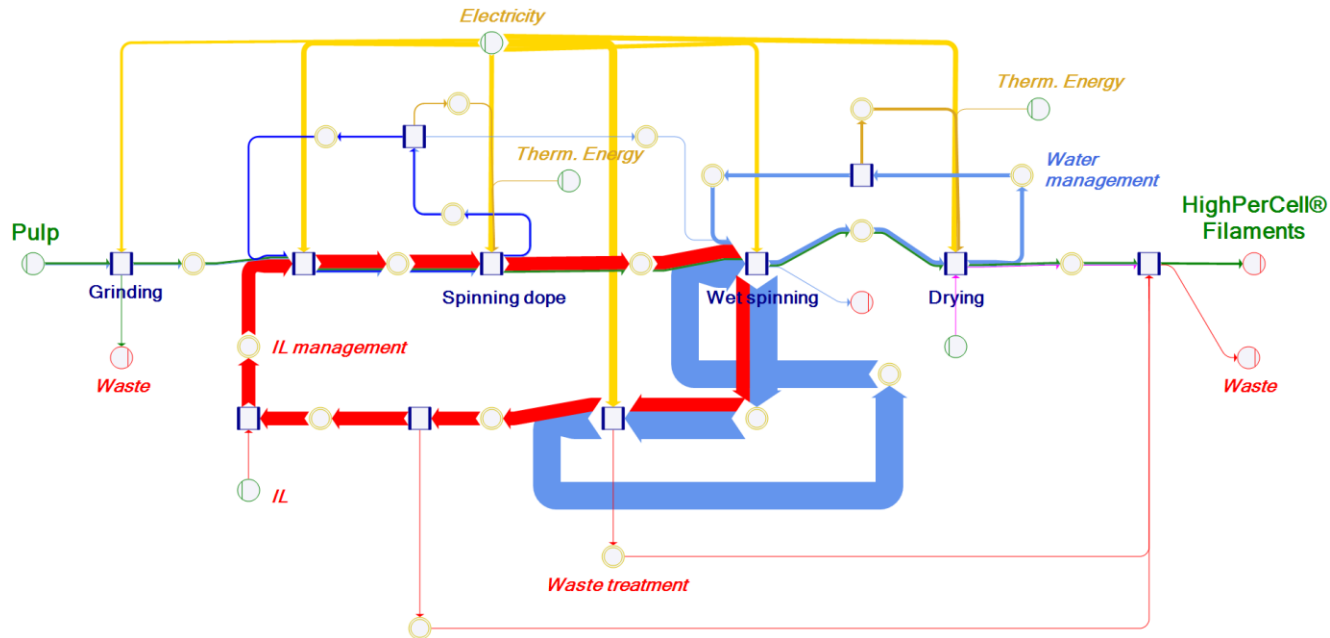
HighPerCell® technology developed by DITF

- Sustainable and ecofriendly patented spinning process
- Direct dissolution of biopolymers based on ionic liquids (IL)
- High versatility of feedstocks
- Low temperature process, no need of stabilizers
- IL selected are non-toxic, non-inflammable, stable, harmful to environment and > 99% recyclable
- Filaments suitable for textile and technical applications



HighPerCell® technology – Spinning of Cellulose Filaments

- Material flow cost accounting (MFCA) performed by Management Research@DITF

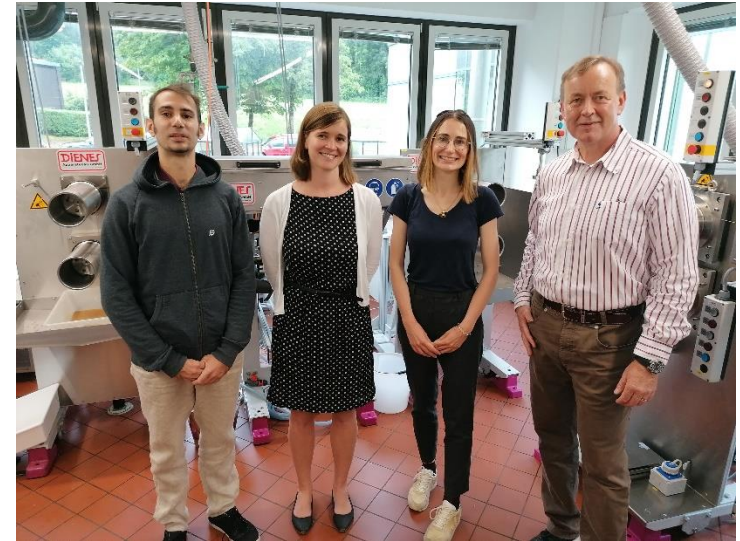


- 3 component system: pulp + IL + water
- Water-saving process (no waste water)
- Closed loop process



Technical cellulose filaments from hemp (HighPerCell® x Iroony®)

- ELIIT project: 09/2020 - 08/2021
- **Goal:** Market potential of hemp cellulosic pulp produced by an unique patented process and its possible transformation into cellulose filaments through HighPerCell® technology
- Ongoing collaboration until now (R&D, Up-scaling filament)



Anne Reboux
Co-founder / Managing Director
ELIIT role : project manager

Charles Reboux
Co-founder / President & CTO
ELIIT role : technical expert
on hemp & textile supply chain



European
Commission

ELIIT Project is funded by COSME Programme of the European Union for the competitiveness of Enterprises and Small and Medium-Sized Enterprises (SMEs)



Technical cellulose filaments from hemp (HighPerCell® x Iroony®)



- Hemp key facts : ✓ Massive carbon sink (about 15 tons of CO₂ per hectare)
- ✓ Fast growing (4 months), resistant
- ✓ No irrigation, no pesticides
- ✓ Soil restructuration
- ✓ Per ha: 4-6 tones of stalks, ~ 1 tons of seeds source of proteins
- ✓ France No 1 producer in Europe with more than 22.000 Ha



Technical cellulose filaments from hemp (HighPerCell® x Iroony®)

- RBX is part of "Hemp & organic Linen association" and works with different agricultural partners, from large cooperatives (Coopérative linière du Nord de Caen) to smaller farming groups (ex: Chanvre Mellois)
- ✓ Rotational farming
- ✓ Sourcing to any hemp cultivation model, no specific retting
- ✓ Optimized valuation of stalks (use of by-products)
- ✓ Possible mix tested (miscanthus, flax)
- Patented pulp production process by RBX

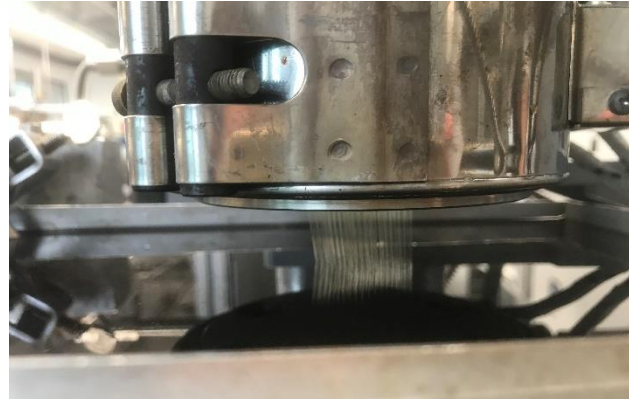


Technical cellulose filaments from hemp (HighPerCell® x Iroony®)



Hemp pulp

- α -cellulose content > 91%
- Ash content < 0.3 wt.-%
- 100% dissolvable in IL



HighPerCell® technology

- Fresh and recycled solvent
- Spinning temperatures < 80 °C
- Dope concentration: 12 wt.-%



Continuous cellulose filaments

Elongation [%]:	5-12
Tenacity [cN/tex]:	25-45
Titer [dtex]:	2.0-3.3
Young's modulus [cN/tex]	1600-2600

Application of cellulose filaments from hemp (HighPerCell® x Iroony®)



Filament yarns

High end clothing,
Technical textiles

*Filaments can be directed processed
to knitted or woven fabrics*

Staple fibres
(ring spun yarns,
non woven)

Wipes, filtration



Sondès L J

Casual wear,
underwear, footwear,
home textiles

SUMMARY

- **Hemp** feedstock efficiently processed to support its cultivation
- **Local** feedstock, 100% **traceability**, 100% **renewable** resource
- **Environmental** friendly pulp: cellulose-rich and high purity
- Successful application in **HighPerCell**® spinning process
- Suitable for **textile** and **technical** applications
- ***Iroony**® hemp fibers are more sustainable compared to oil-based, cotton and viscose fibers (first LCA)*
- ***Iroony**® hemp fibers through HighPerCell® perfectly meeting market demands for both low-impact & quality materials*



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Thank you for your attention

Spinning for the future.