Aalto University
School of Chemical
Engineering

Man-Made Fibers in the Future

FINIX Seminar

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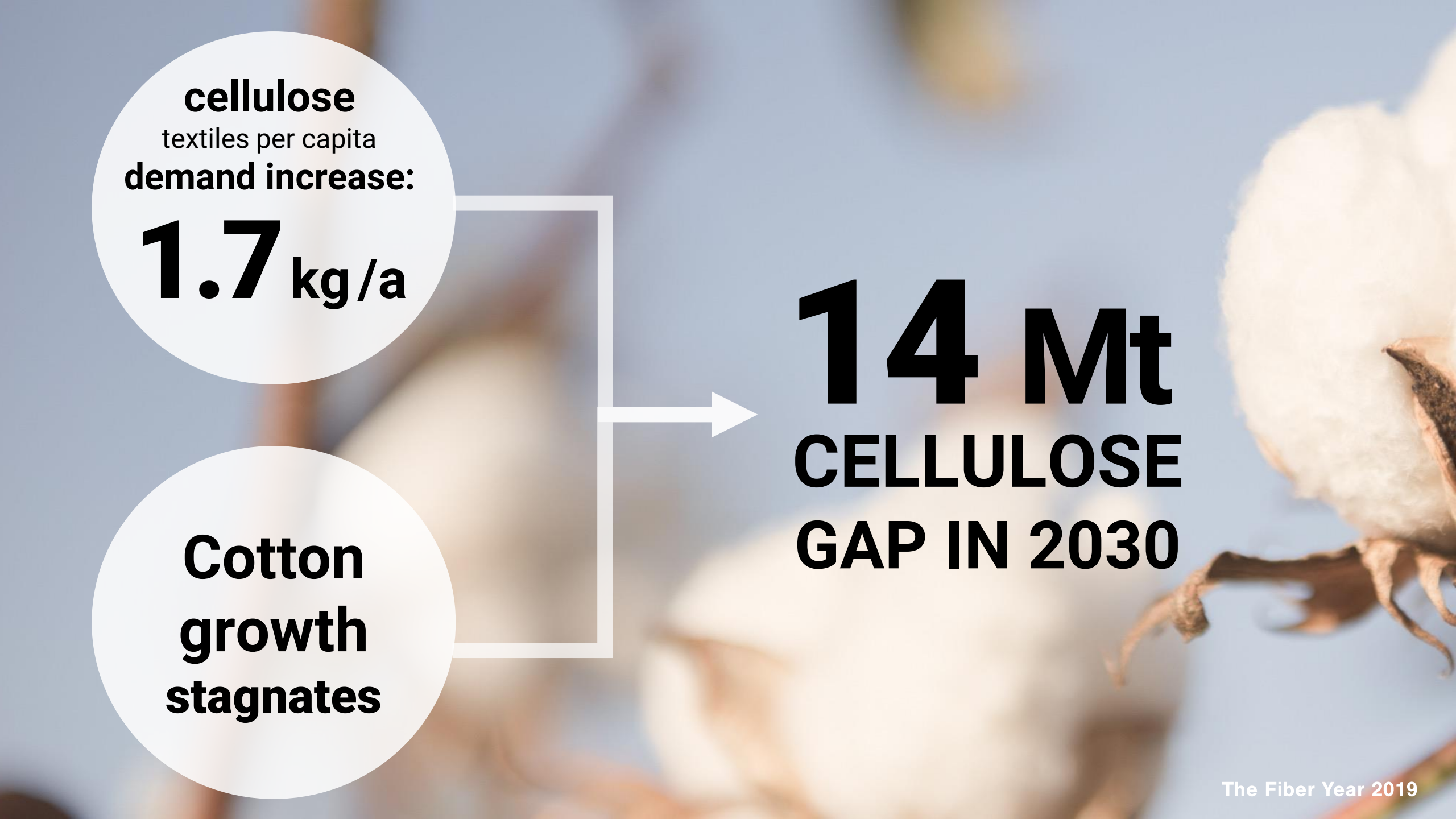

cellulose
textiles per capita
demand increase:
1.7 kg/a
Cotton
growth
stagnates
14 Mt
CELLULOSE
GAP IN 2030
The Fiber Year 2019


73%
of textiles
landfilled or
incinerated
Ellen MacArthur Foundation

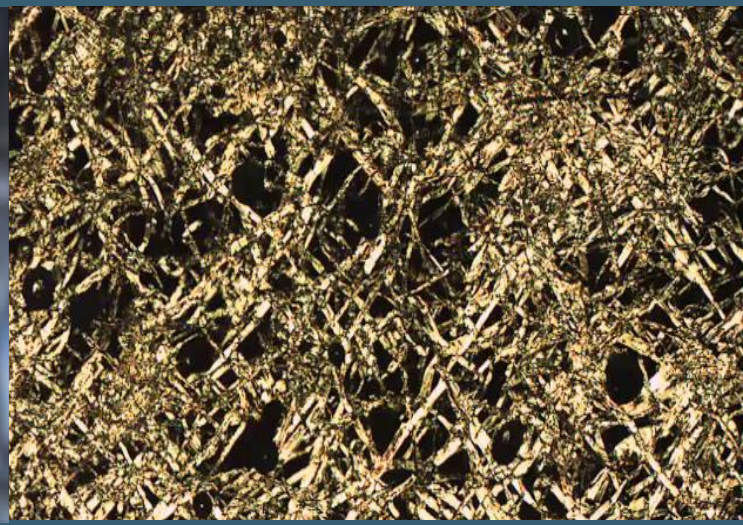

Cotton
accounts for
16%
global insecticide
releases
Environmental Justice Foundation, info@ejfoundatio

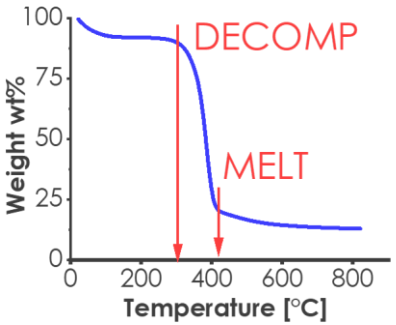
Environmental Justice Foundation, info@ejfoundation.org

Opportunity:

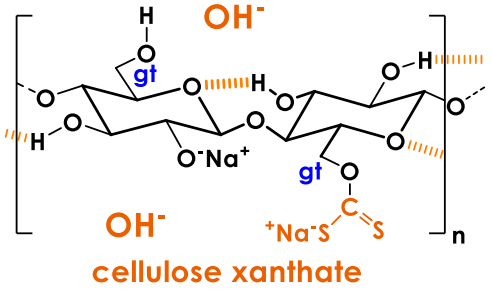
Closed-Loop Man-Made Cellulose Fiber Process

How to make Cellulose Fibers?





NOT MELTABLE

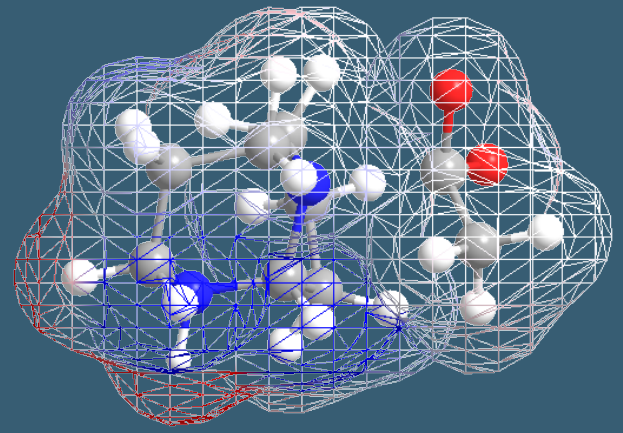


cellulose xanthate

VISCOSE CARBAMATE

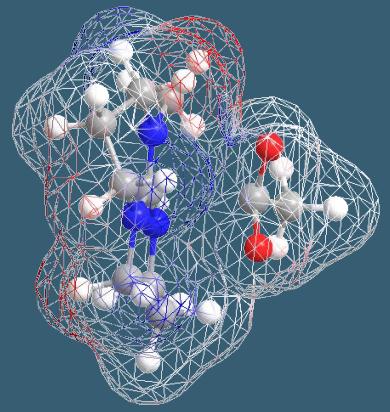
DIRECT DISSOLUTION LYOCELL

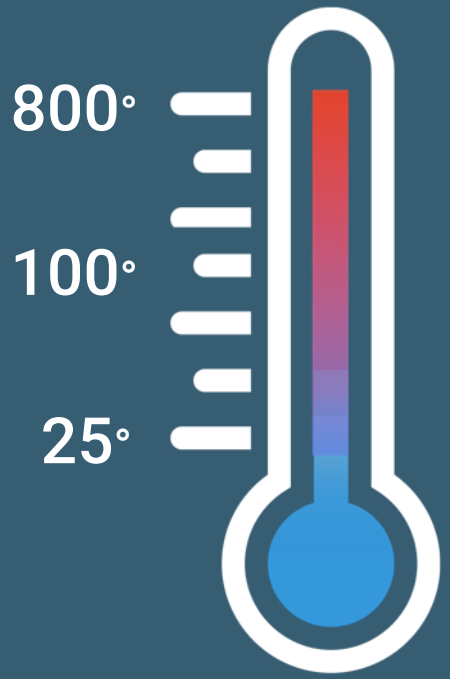
Lýein = dissolve

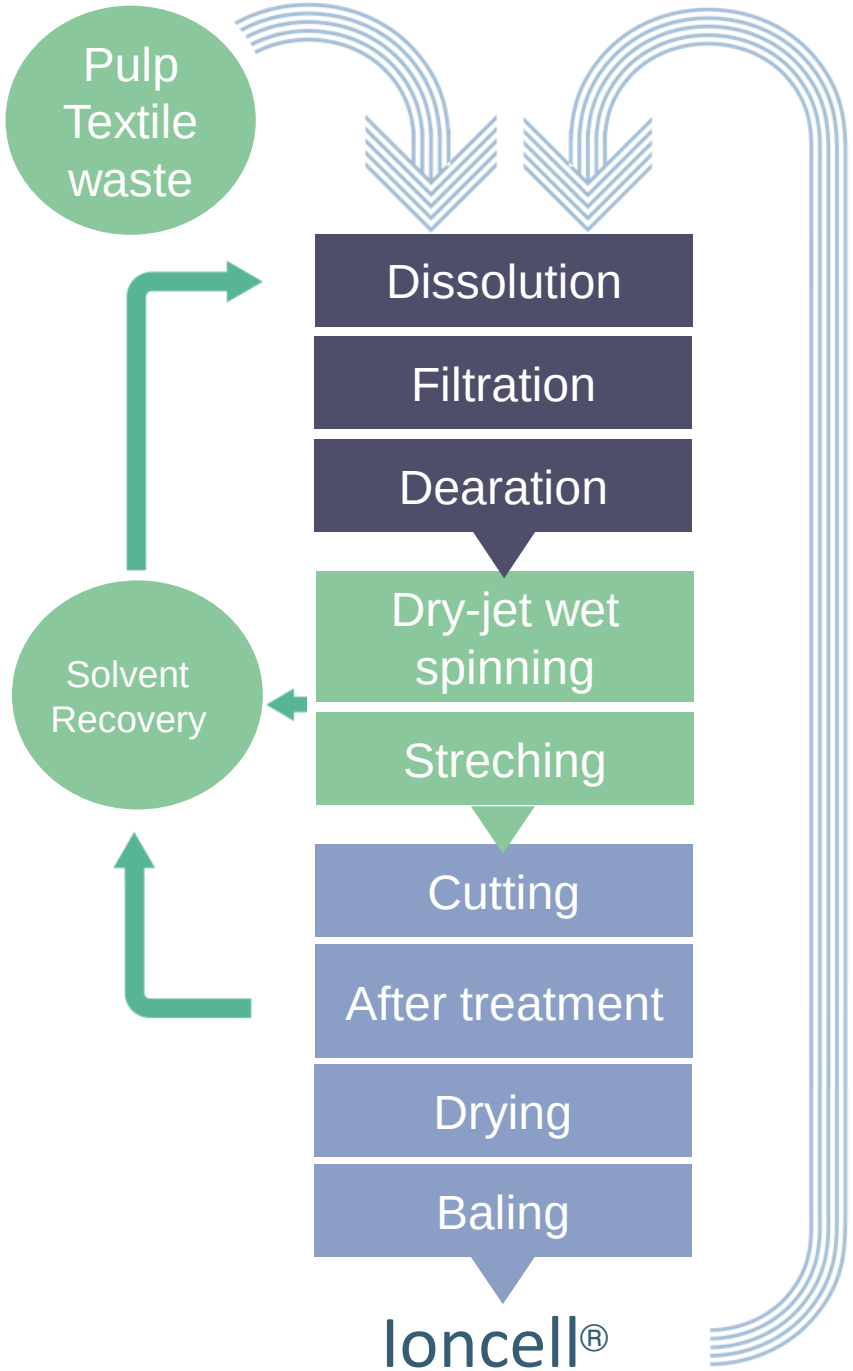


Green solvent

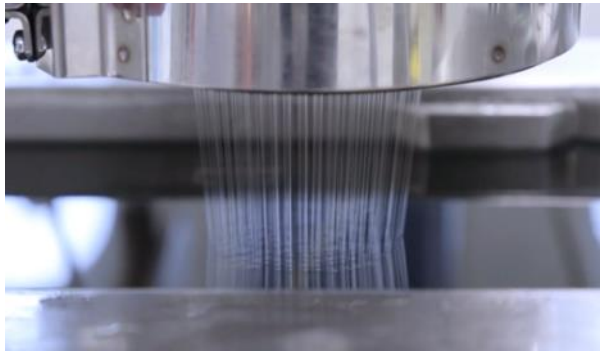
Ionic Liquids are liquid salts at T <100°C







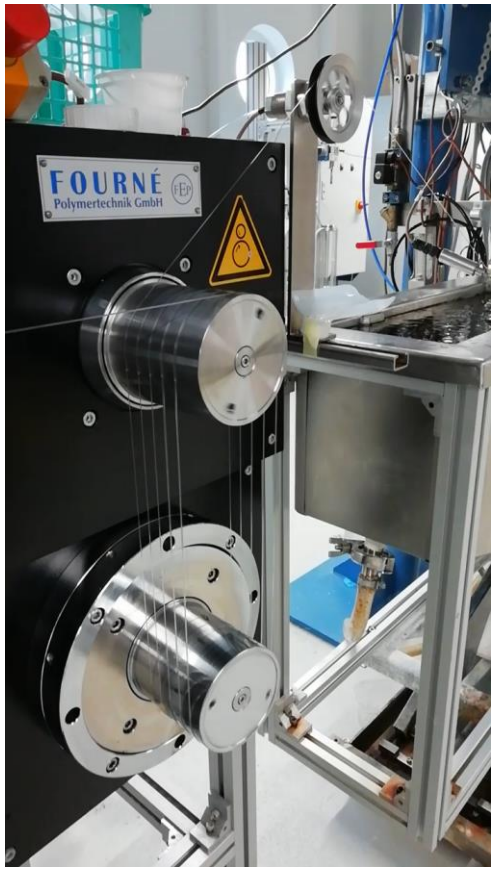
Ioncell®
Lyocell Process



Challenges

Stable air-gap spinning

High Filament stretching

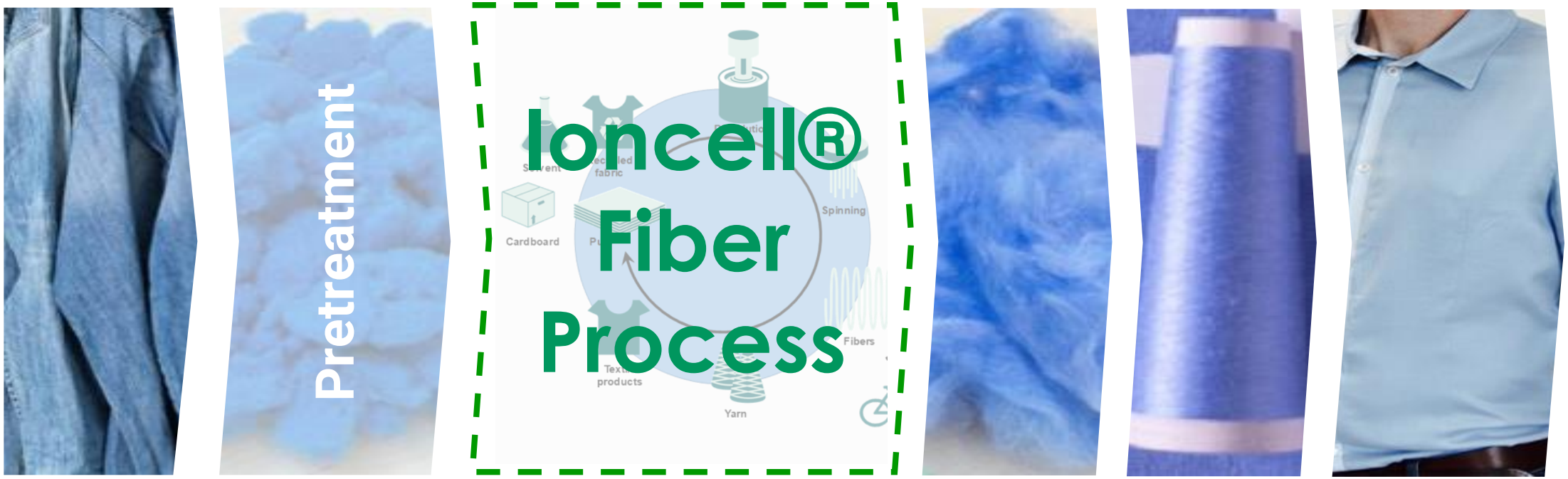


Soft, good handle High toughness

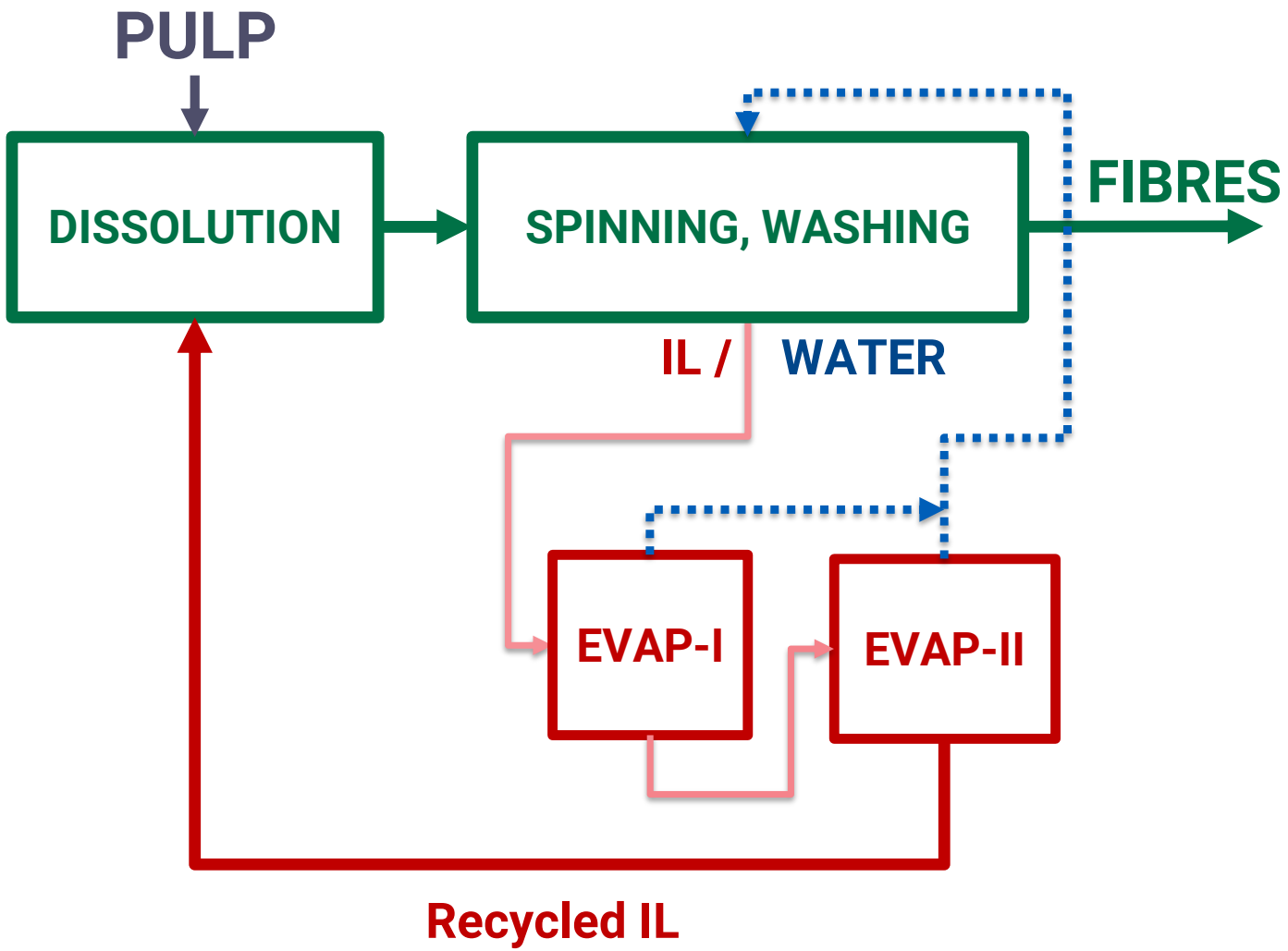
Sixta, H. et al (2018) unpublished

Textile fiber from Sustainably Grown Wood

Textile fiber from Textile Waste



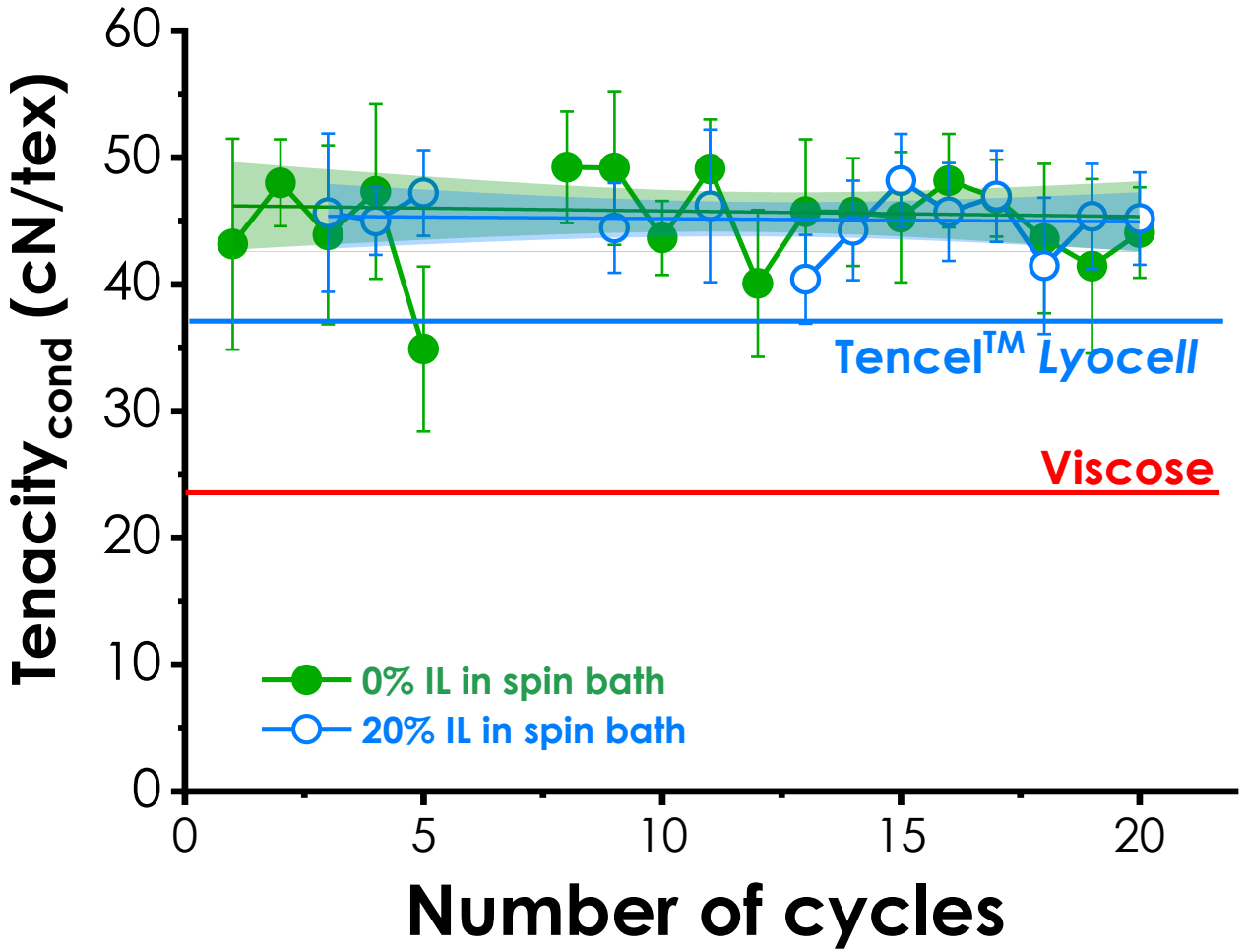
Solvent Recycling



Fiber properties from recycle solvent

Recycling Rate Ionic Liquid (Lab)

>99%



Elsayed S. et al. (2019) unpublished results

Products from Wood Pulp

Products from Recycled Textile Waste or Paper Waste

Products from Recycled Jeans

On the occasion of President Macron's visit August 2018

Haslinger S. et al. *Green Chem.*, 2019, 21, 5598

Products from Recycled Jeans

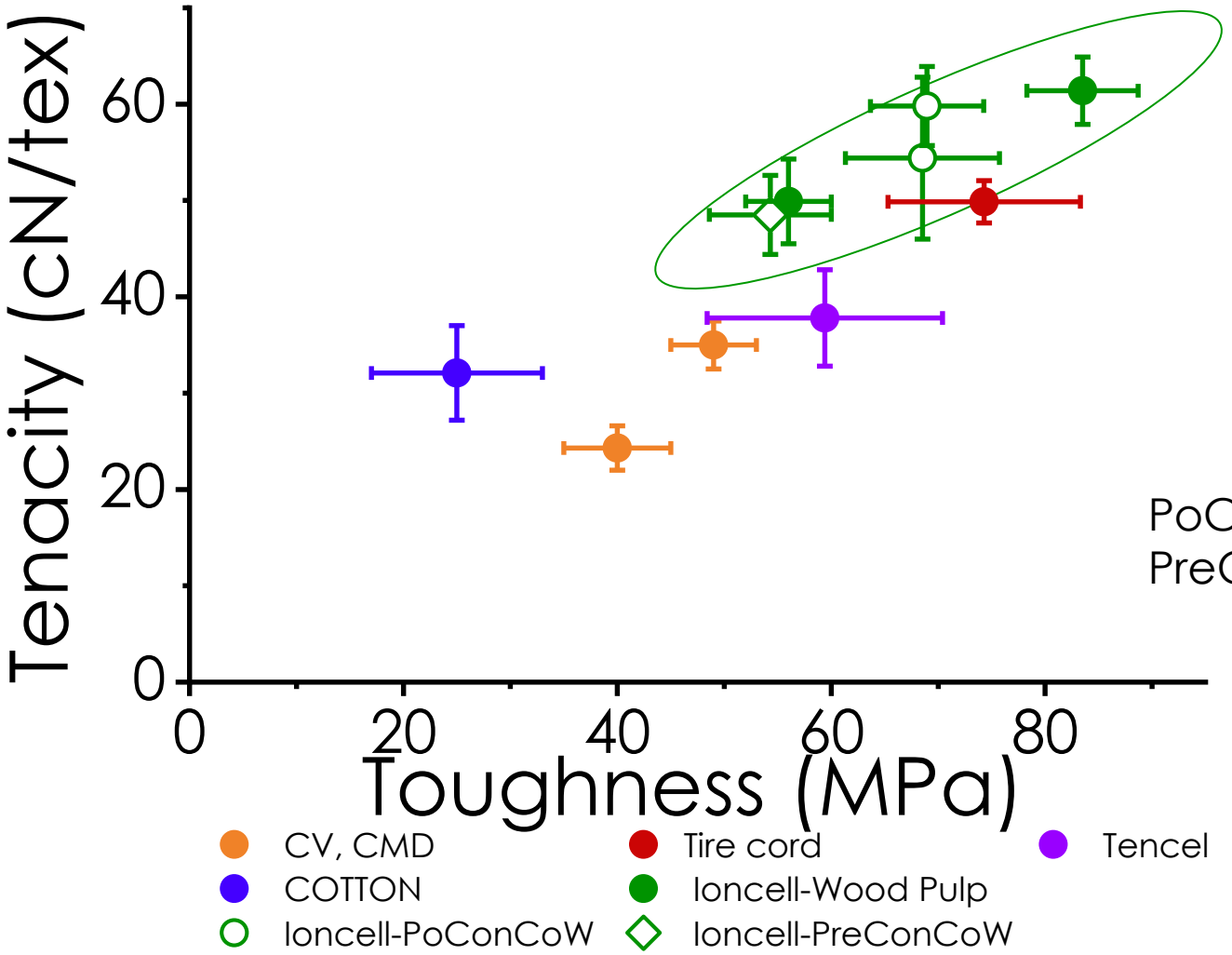
T2C (Söktas)

T2C (Reima)

New Fibers from old Jeans

Haslinger S. et al. *Green Chem.*, 2019, 21, 5598

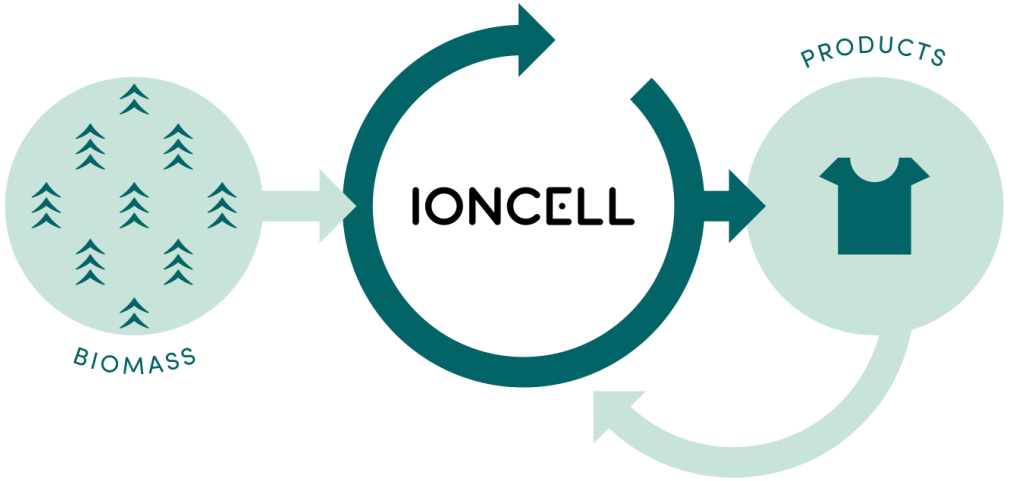
Properties of Ioncell® fibers from Pulp and Textile Waste



PoConCoW: Postconsumer Cotton Waste
PreConCoW: Preconsumer Cotton Waste

Summary of Ioncell® Fibers

Ioncell® superior to commercial Cellulose fibers in mechanical and other textile-related properties



Ioncell® upcycles Cotton Waste

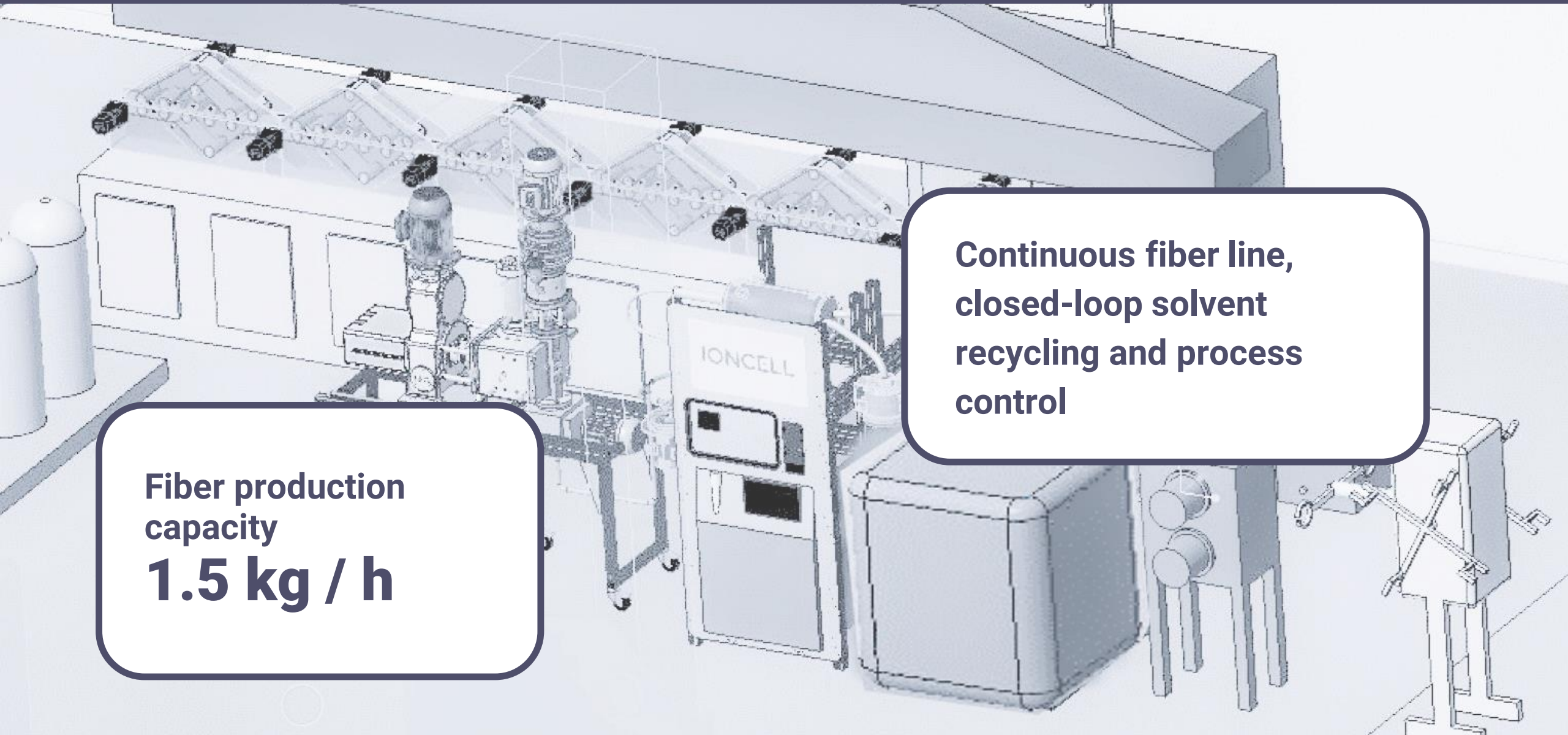
Properties of Ioncell® fibers from cellulosic textile waste much better than those of virgin Cotton fibers

Ioncell® Pilot plant

Start-up fiber line:	**1/2021**
Pilot phase 1:	**2021 – 2022**
Pilot phase 2:	**2023 – 2025**

Strategy: joint process development with industrial partners

Ioncell® Pilot at Aalto Bioproduct Centre



Continuous fiber line, closed-loop solvent recycling and process control

Fiber production capacity

1.5 kg / h

Thank you!