Highlights of DWoC

18.5.2016 Anna Suurnäkki, VTT
Cellulose
–The next supermaterial?

‘Cellulose is the substance that makes up most of a plant's cell walls. Since it is made by all plants, it is probably the most abundant organic compound on Earth. According to how it is treated, cellulose can be used to make pulp, paper, film, textiles, explosives, and plastics, in addition to having many other industrial uses. For humans, cellulose is also a major source of needed fiber in our diet.’

http://www.scienceclarified.com/Ca-Ch/Cellulose.html#ixzz3mggOsTDR
Designing Cellulose for the Future

*Design Driven Value Chains in the World of Cellulose* (DWoC) is an interdisciplinary Finnish research project focused on finding new and innovative applications and business models for wood-based cellulose materials.

DWoC combines design thinking, design-driven prototyping and business insight with a strong competence in technology development.
DWoC project

Duration: 1.6.2013 - 31.3.2018

Strategic opening funded by Tekes, The Finnish Funding Agency for Innovation. Total funding 11 M€ / 5 years.

Project partners:
VTT, The Technical Research Centre of Finland
Aalto University
Tampere University of Technology
University of Vaasa
DWoC vision

Transformation of the Finnish large scale forest bioeconomy to a vivid ecosystem containing both large scale and small scale businesses based on wood cellulose.

Increase both in Volume and Value
DWoC aims to accelerate

- New Businesses
- Branded Cellulosic Products
- Student Engagement
- Eco-Design and Design Approach
- Business and Technology Concepts
- Enable New Industries
DWoC activities

NEW DESIGN DRIVEN TECHNOLOGY DEVELOPMENT
- Combining hypothesis driven technology development to design driven prototyping
- Exploring and implementing new interdisciplinary collaboration models between design and science

COMMUNICATION & PROMOTION
- Refreshing the image of cellulose to a trendy raw material for a wide variety of end-uses and as a sustainable supermaterial for the future

CONCEPTS & PROTOTYPING
- Future oriented and user focused concept design and prototyping

BUSINESS SEEDS
- Generation of future business seeds for new design-driven cellulose business concepts
Main achievements of DWoC 1.0

TECHNOLOGY LEAPS
by co-creation model based on design driven prototyping and hypothesis driven technology development

SPINNOVA spin-off
company for production of fibre yarn directly from wood pulp (without dissolution and regeneration) started in the beginning of 2015

Fibre yarn directly from cellulose pulp or nanocellulose

Textiles from recycled paper and from lignin containing materials with intrinsic lignin derived color

New textiles structures by 3D direct write printing of thermoplastic cellulose

Designed 3D foams from cellulose fibres
DWoC 2.0: focus areas 2015-2018

Home and everyday life (including textiles): Making use of inherent cellulose properties to enable streamlined production of functional and supporting structures for home environment and everyday use.

Health and wellbeing: Exploiting biocompatibility, non-toxicity and anti-allergenic properties of cellulose in the growing market for health and wellbeing.

Building and landscaping: Cellulose-based solutions for healthy and convertible buildings and functionality for environmentally conscious landscaping.
DWoC 2.0 : Work on progress

Design driven raw material and technology research
• Various filament (fibre yarn) forming technologies
• New machinery for continuous filament production
• Applications of nanocellulose
• All-cellulose structures and materials
• Textile fibers from paperwaste with Ioncell-F
• 3D printing on textiles with paste-like materials

New cellulose-based business ecosystem research and creation
Exploring nanocellulose

- Filaments for composite reinforcement & Machinery for filament production
- Transparent, colored films
- Coatings by spraying
- Hard objects from 100% nanocellulose
- All-cellulose composites
- Colorisation
Breakthrough technologies – filament/ yarn production

- Novel methods for preparation of wood cellulose based yarn without dissolution developed
  1. Production of yarn using deep eutectic solvent (Patent pending)
  2. Production of yarn from CNF using water-based process
- Crosslinking of DES fibre yarns for water resistance
Designing cellulose for the future II
18.5.2016
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www.cellulosefromfinland.fi