



DESIGN DRIVEN
VALUE CHAINS
IN THE **WORLD**
OF CELLULOSE
DWoC

Conductive cellulose-based material for living spaces

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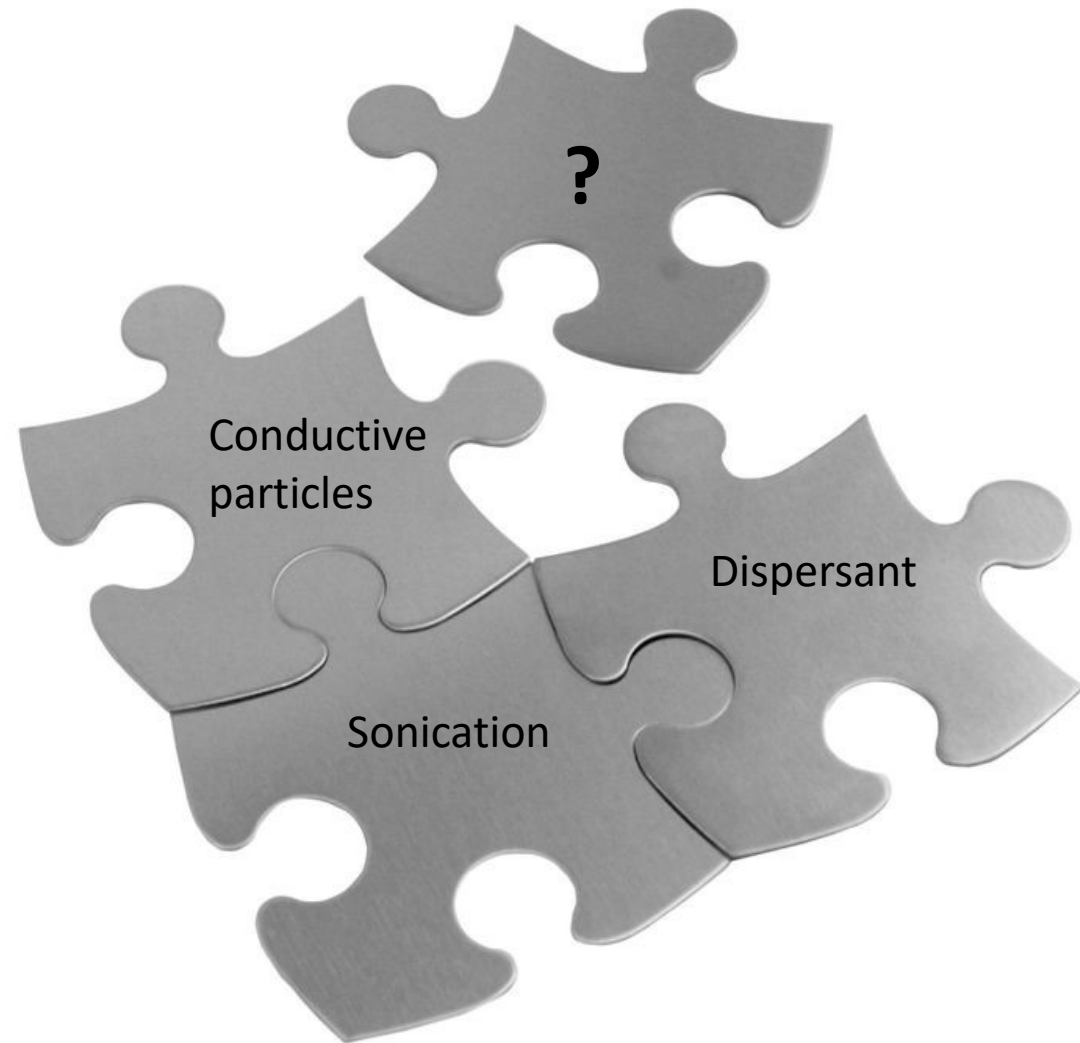
Aim

- How to achieve optimum conductive properties to cellulose based non-woven?
- Using minimum amount of materials and chemicals
- With minimum processing steps
 - Foam forming

Trial and error

Combining conductive particles, dispersant and using sonication process to achieve high quality dispersion which can be used in **foam forming**.

→ Particles were too tiny and did not have adhesion to matrix fibres



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Heureka!

NANOCELLULOSE

**MULTIWALL
CARBON
NANOTUBES**

SURFACTANT

SONICATION

Tekes

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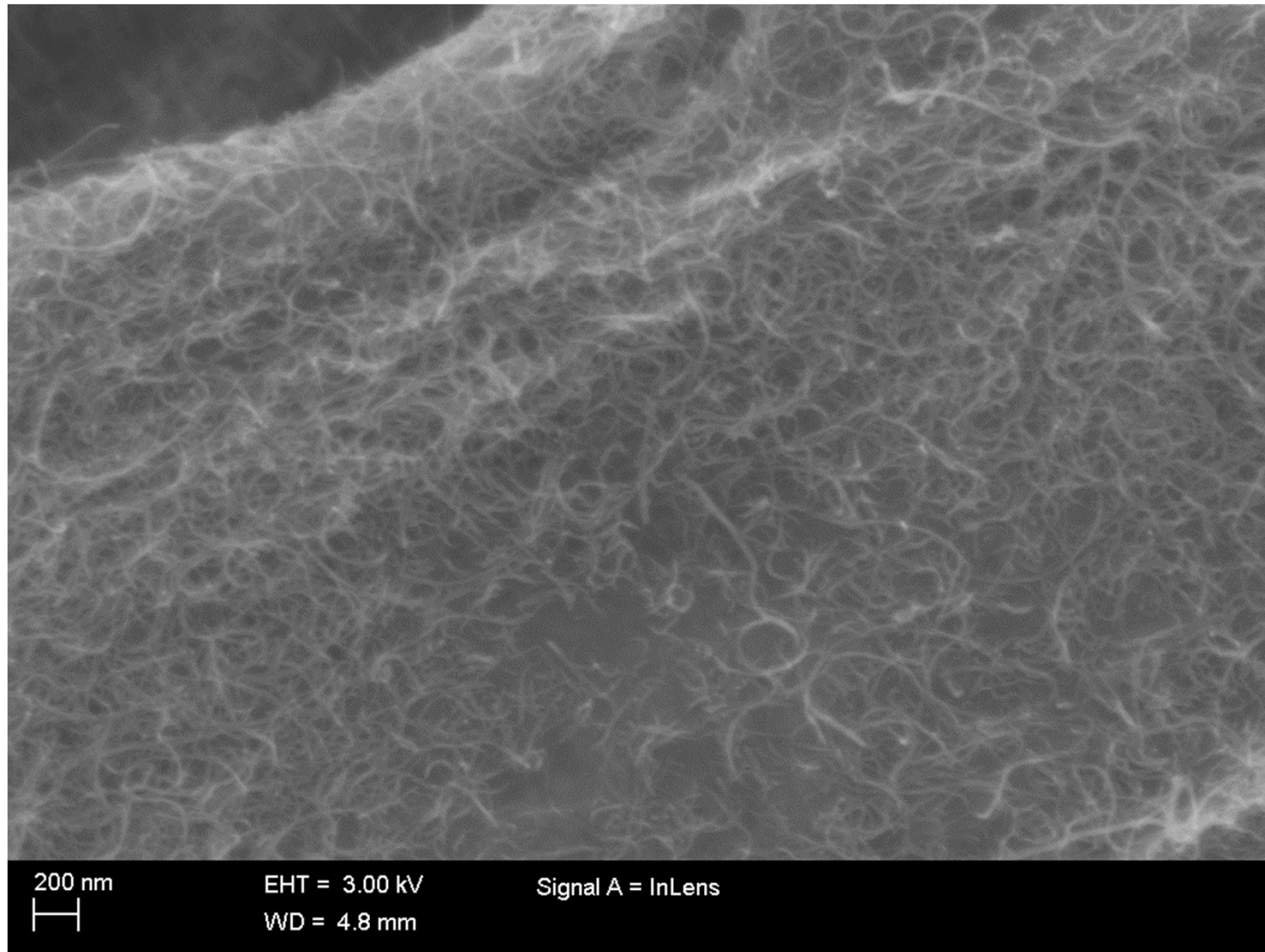
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Invention



Materials and manufacturing

- **Step 1:** Homogenization of dispersion
 - Materials: Carbon nanotubes, Nanocellulose, surfactant and water
 - Process: Sonication
- **Step 2:** Processing of the non-woven
 - Materials: Dispersion, Matrix fibers (viscose, cellulose pulp) and water
 - Process: Foam forming
 - Product: sheet, 3D-shape

Conductive non-woven

- Electrical conductivity
 - Joule heating
 - Heating element
- Low voltage
 - Safe and easy to install
- Heating of total volume
 - No heating copper wire
 - No chemicals or chemical reaction



Design by Anastasia Ivanova

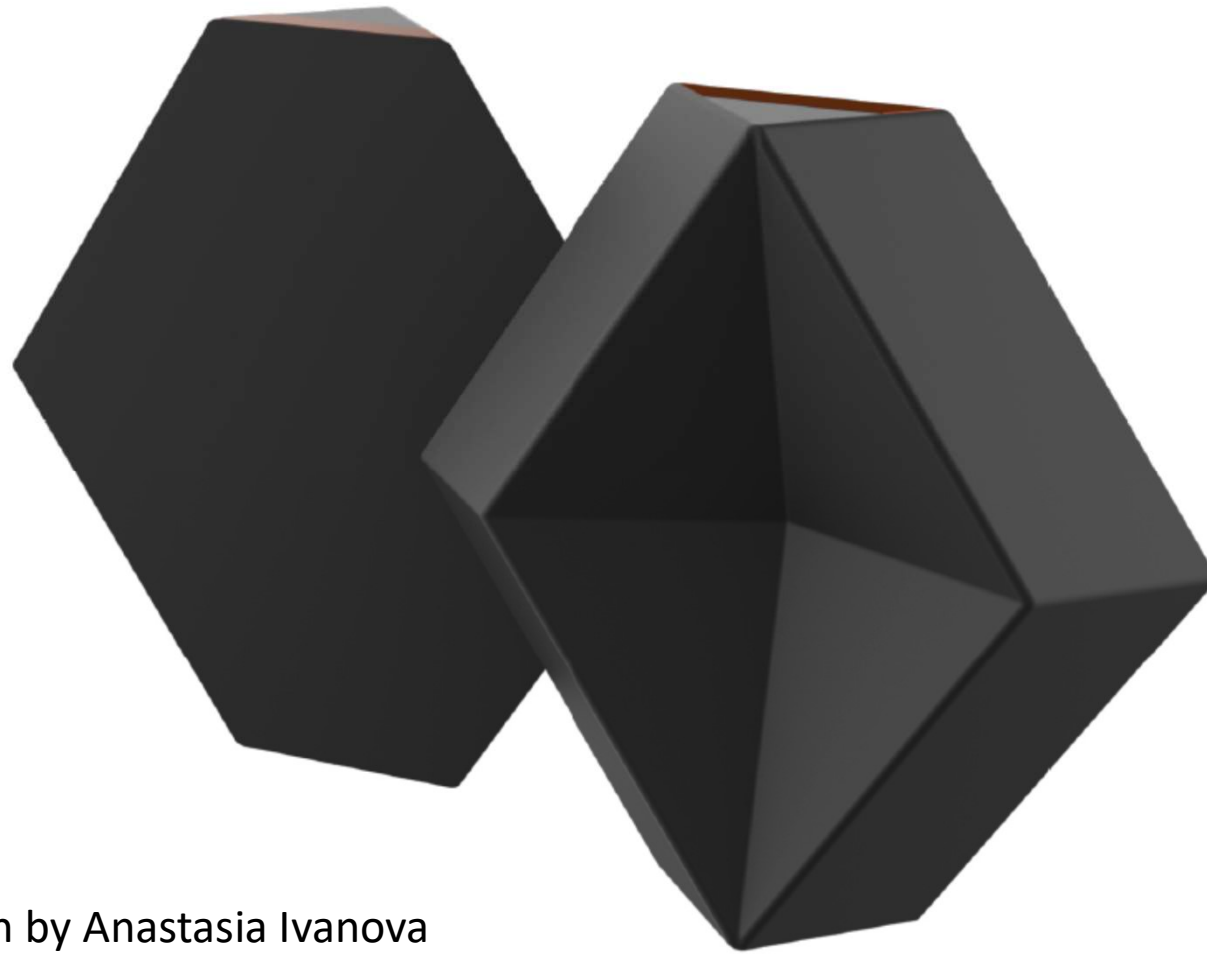
- Products with similar functionality currently in the market
 - Seat heater
 - Shoe sole heating
 - Chemical reaction pouch
 - Radiator (oil filled)

Value proposition of the heating element

- Improved safety:
 - No hotspots, no fire hazard
 - CNTs act as a fire retardant
 - Customization of the maximum temperature
 - Rapid cooling
 - No chemical reactions
- Environment friendly materials
 - No plastic
- Cost of production
 - Minimum amount of material and energy to achieve optimal properties
- Customization
 - 3D -form
 - Maximum heating temperature
 - Possibility to implement inside the structure
 - Boat cabin walls
 - Car interior panels
 - Office chair

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Salmiakki



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Conclusions

- It is possible to produce conductive non-woven with only two processing steps
- Limitless possibilities for using this invention in different applications
- Cost of materials used in one Salmiakki 3D- shape is less than 4€

Thank you

PRESENTED BY

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