Innovation Test Bed for development and production of nanomaterials for lightweight embedded electronics

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Coordinator

Team Manager @ Danish Technological Institute

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814485

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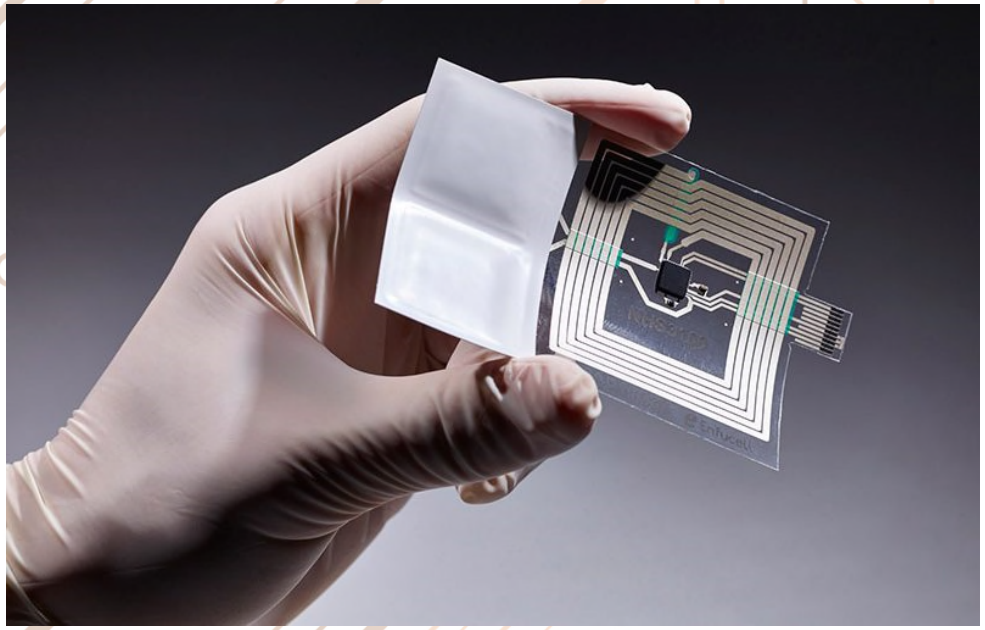
What is lightweight embedded electronics?



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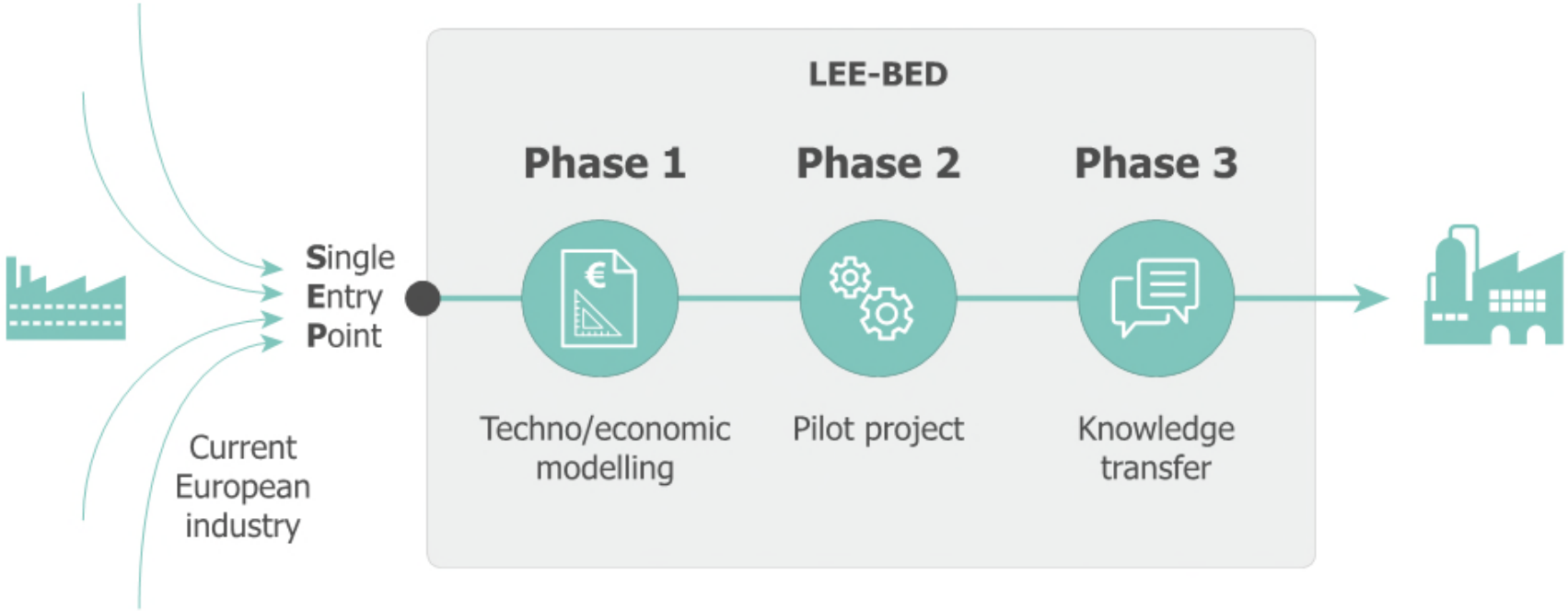
LEE·BED

Innovation Test Bed for development and production of nanomaterials for lightweight embedded electronics

www.lee-bed.eu



The single entry point (SEP) is the main contact point for customers wanted access to LEE-BED services and pilot lines

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LEE-BED partners

13 service and pilot line providers

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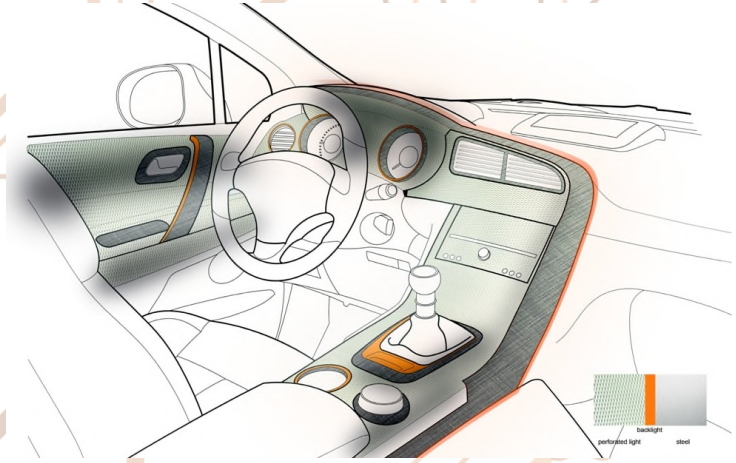
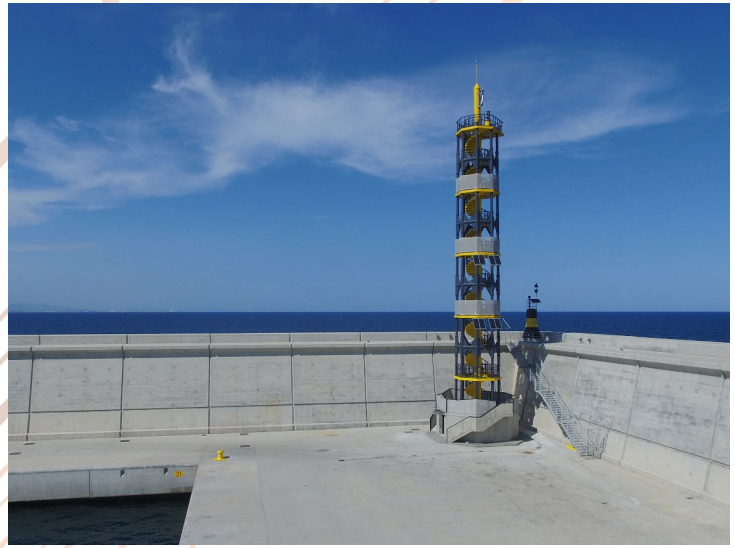
End users

SWAROVSKI



MAIER

grafietic
identificación y sistemas



acciona

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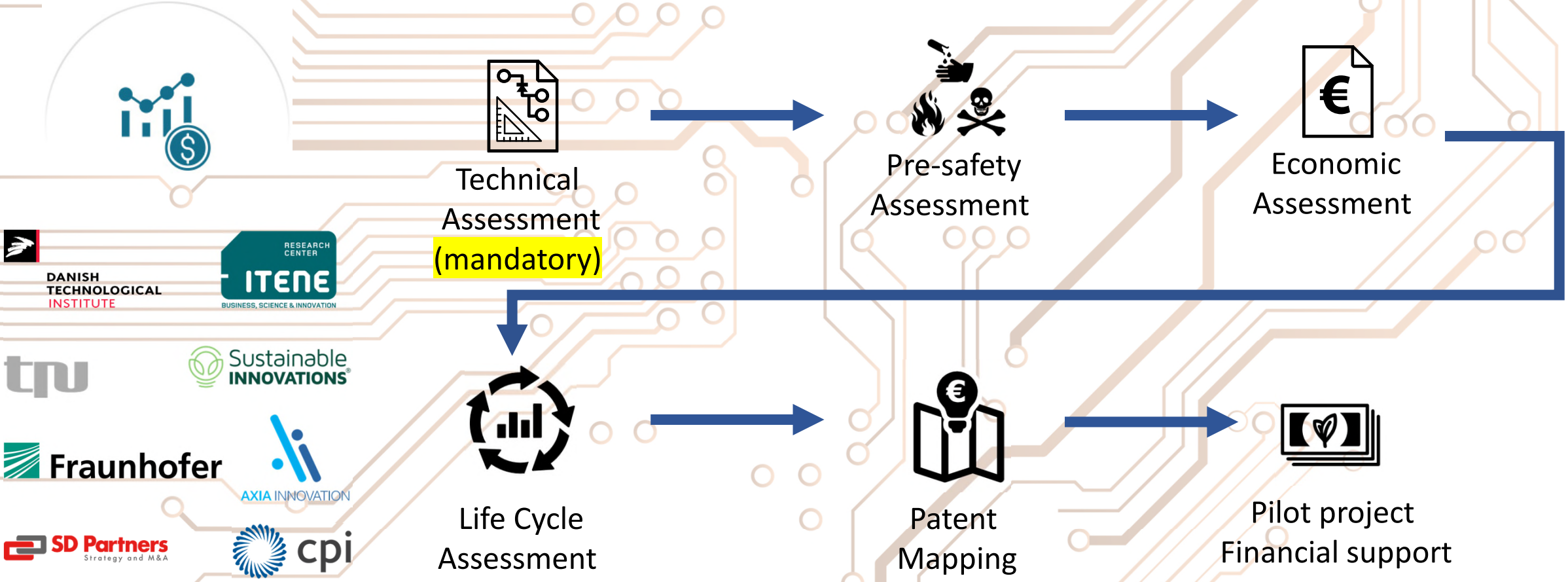
Phase 1: Techno/economic assessement



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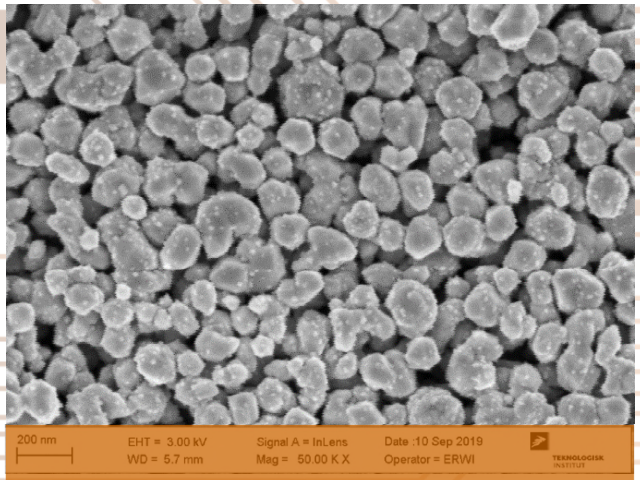
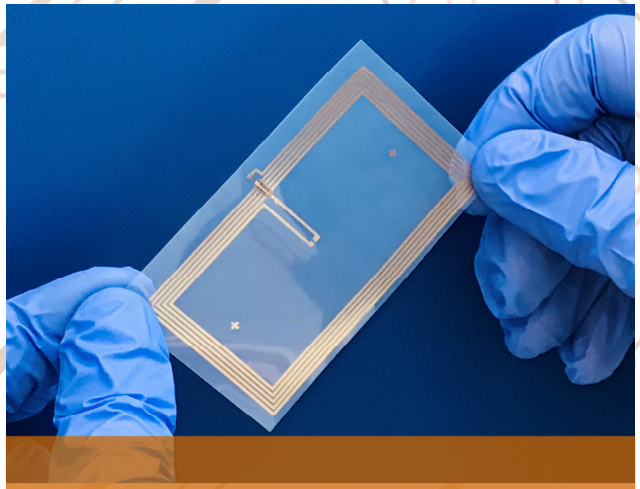
Pilot Projects: Access to pilot lines



Nano materials

Nano enables formulations



Printed & embedded components

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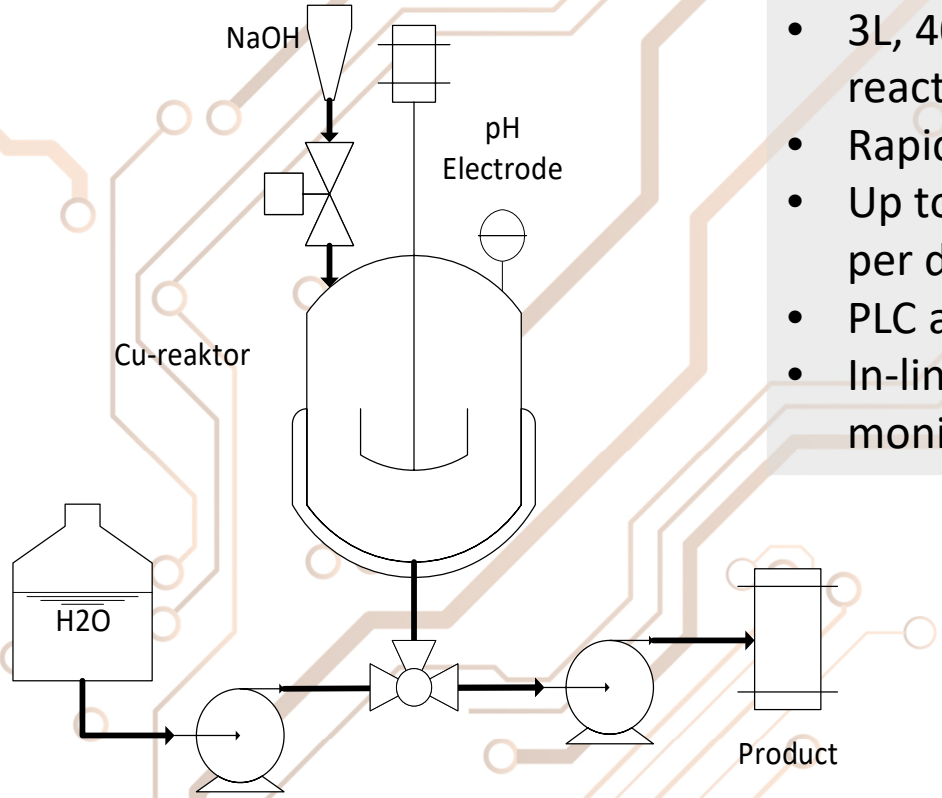
Solvothermal batch pilot line



- 3L, 40L & 80 L jacked reactors
- Rapid screening
- Up to 10kg nanomaterials per day
- PLC automated systems
- In-line process monitoring

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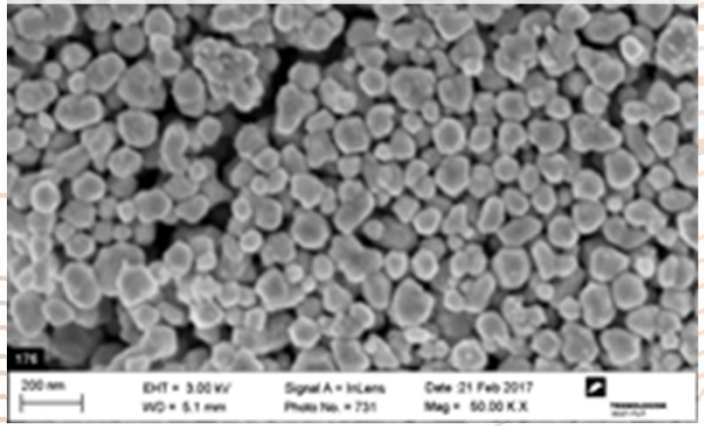
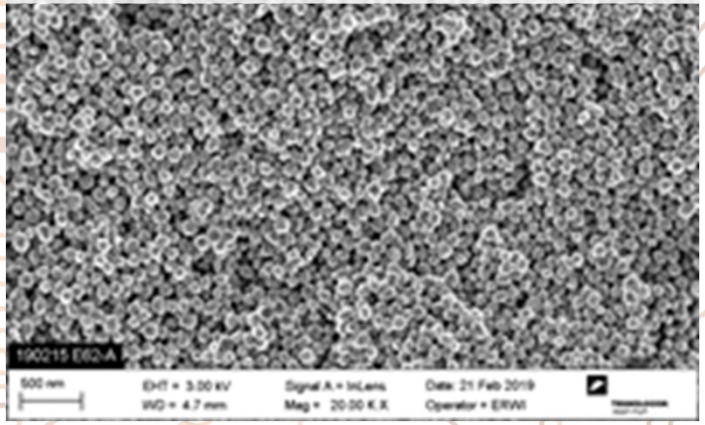
Nanomaterial examples

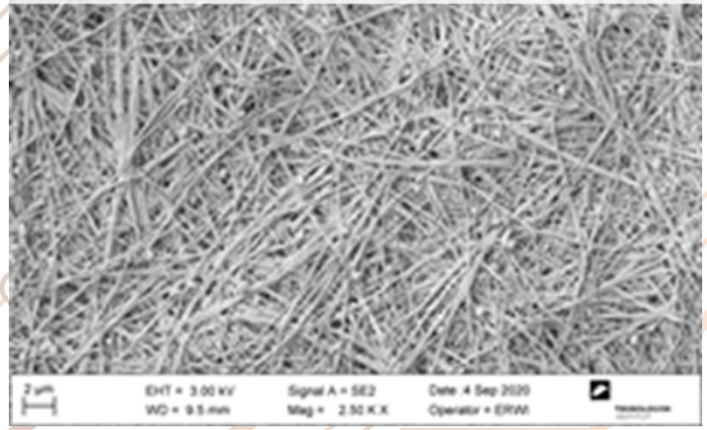
Copper nanoparticles 3 sizes within the range of 100 nm, 200 nm, 1µm



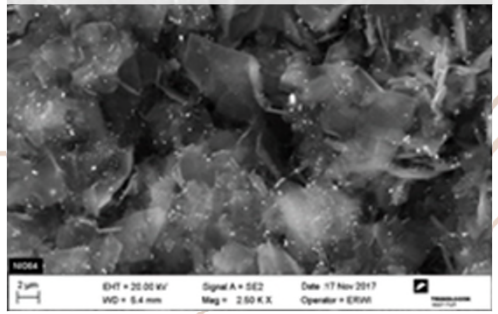
Silver nanoparticles - diameters of 50-100 nm



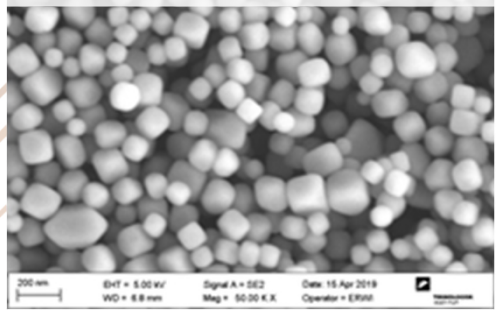
Silver nanowires - diamater 30-60 nm, length 10-50 µm



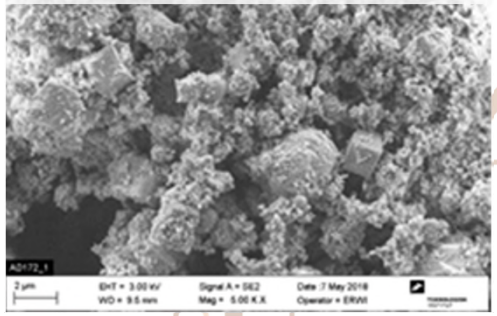
Silver on carbon support



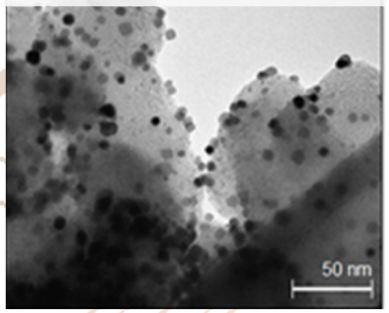
Dielectric materials – $BaTiO_3$



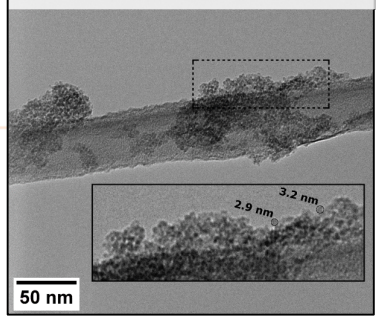
Magnetic/ferrit materials



Pt on carbon support



$Y\text{-}Al_2O_3$ -3 nm



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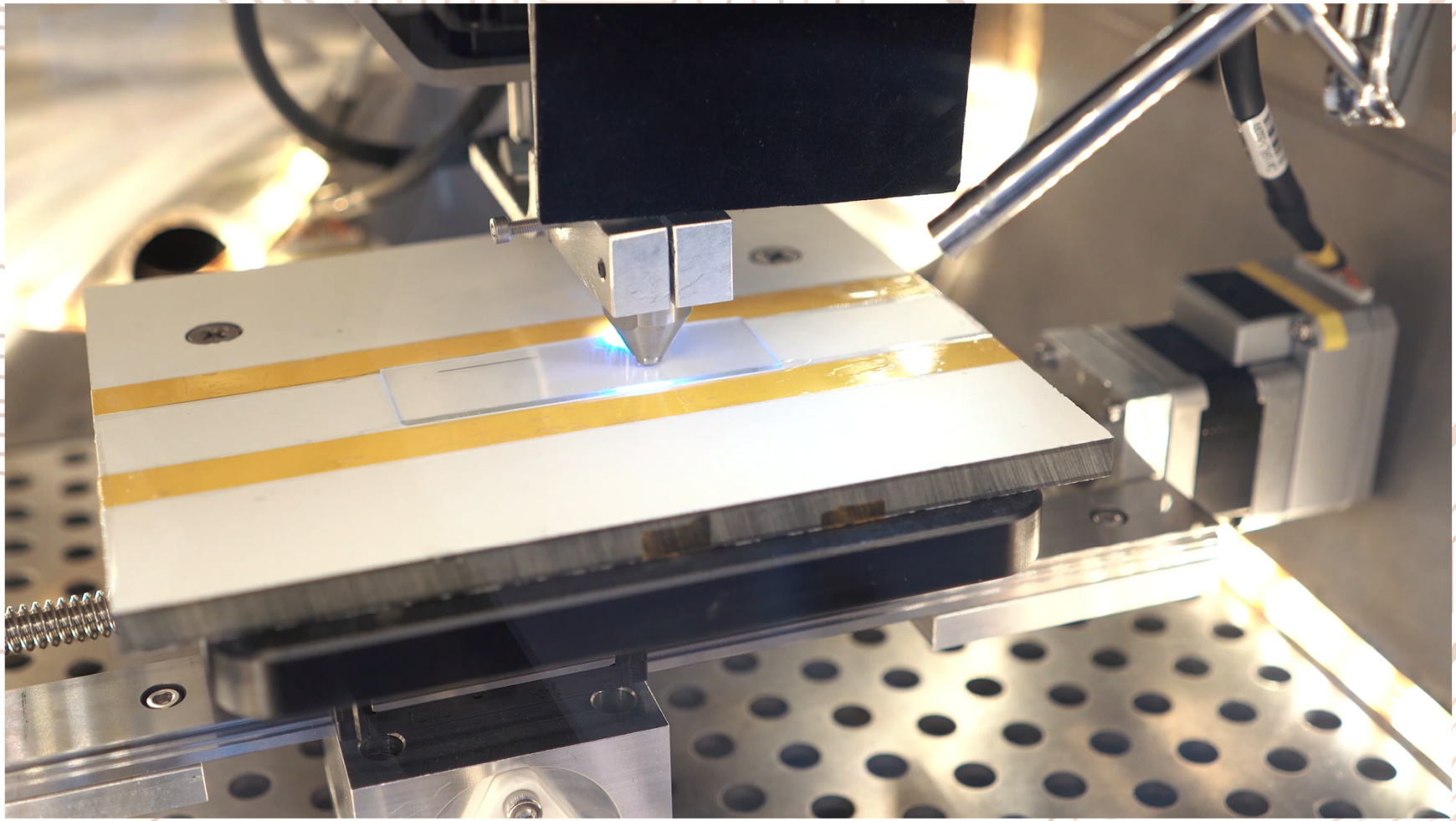
Direct writing of nanomaterials



- Spark-abilatioin process
- Material agnostic using solid conductive targets
- Multi materials

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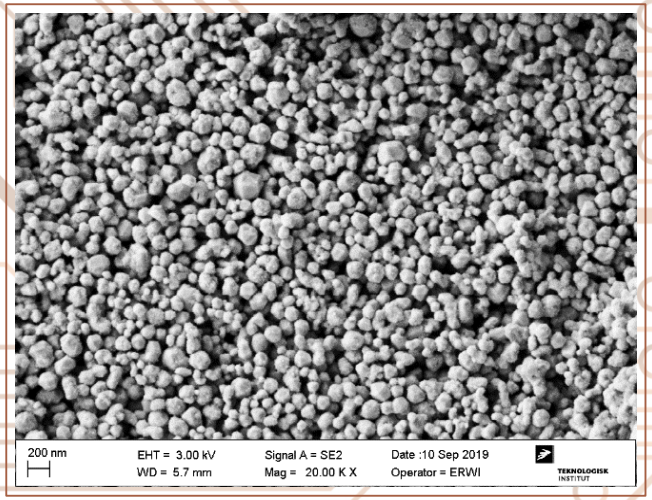
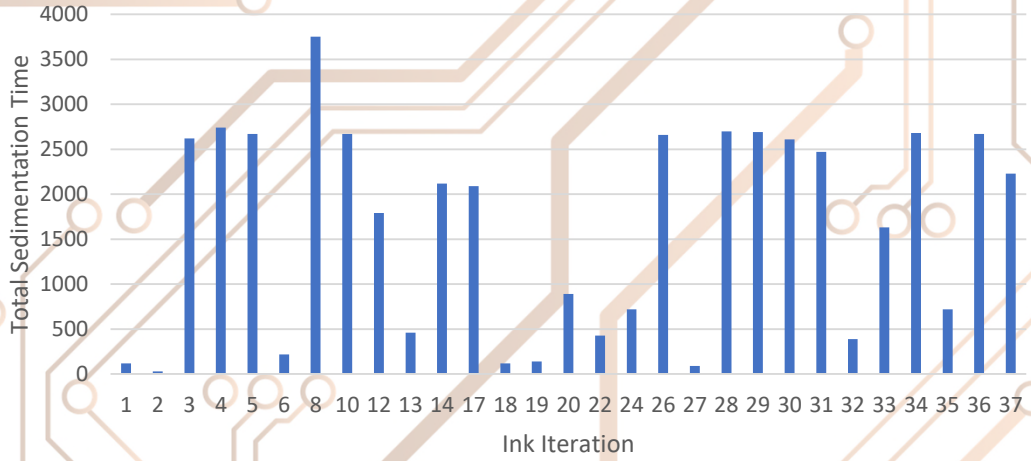
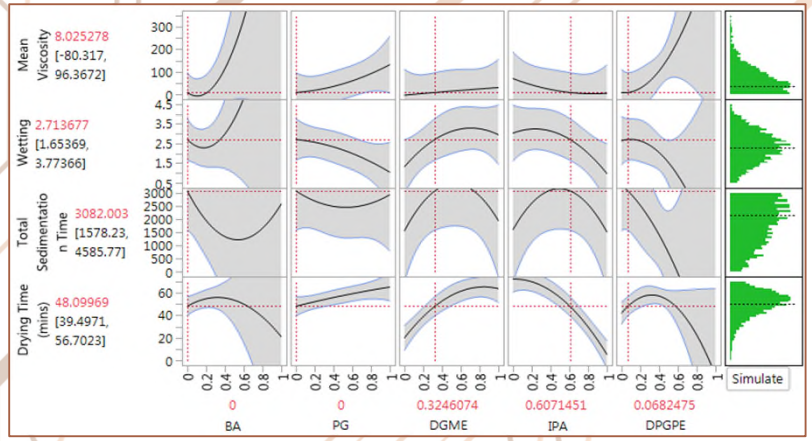
vsparticle

Rapid screening using AI & robotics







- Automated DoE inkjet screening trial of solvent mixes for copper particle dispersion
- 37 iterations of the ink produced automatically
- Results confirmed Principal Component Analysis

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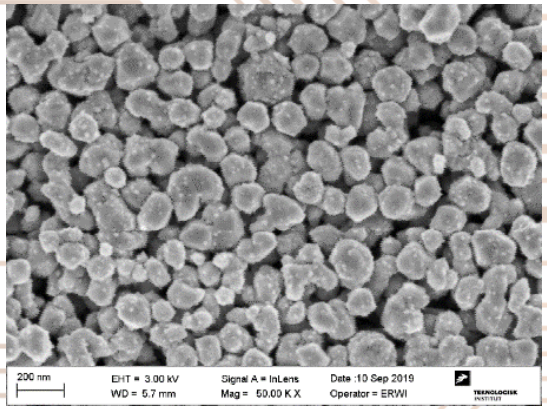
cpi

Copper based ink jet formulation



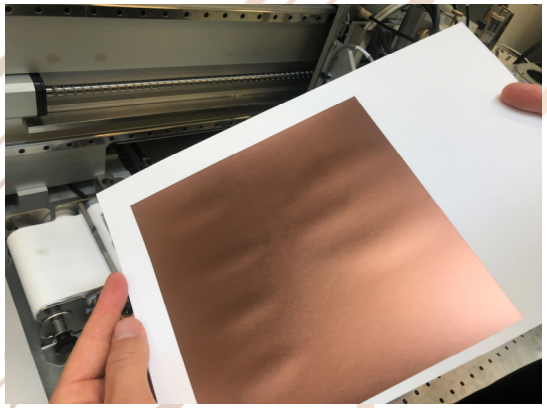
Ink jet formulation

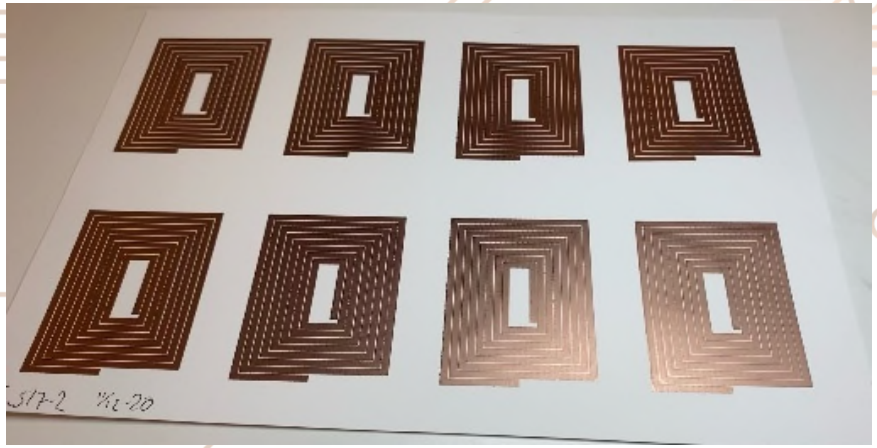
Nano copper pigment 100-200nm size

20-30 wt% metal loading

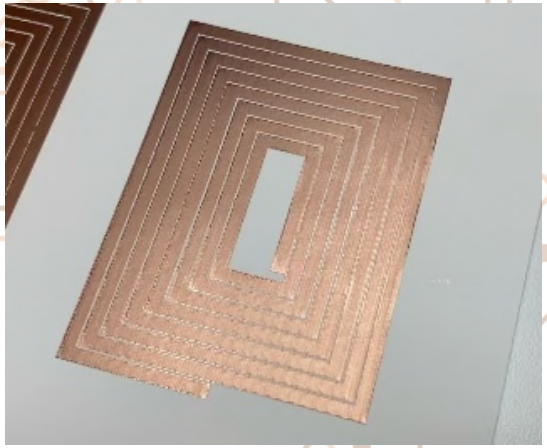
DGME based solvent

Photonic sintering: 1 layer 60 mOhm sq.





Ink jet printed NFC antenna



Ink jet printed strain sensor

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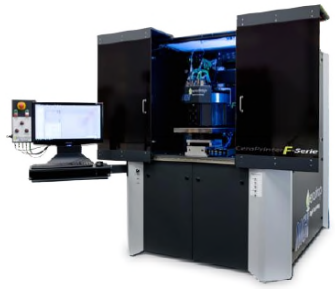
Component pilot lines

Prototyping

3D multi material

S2S inkjet

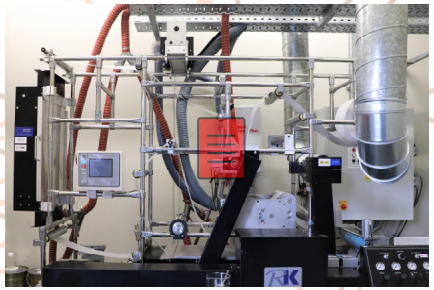


TNO TU/e DANISH TECHNOLOGICAL INSTITUTE RI. SE

- Sheet to sheet
- Multimaterial 3D printing

Production

Packaging



RESEARCH CENTER ITENE BUSINESS, SCIENCE & INNOVATION

IoT

cpi

Large format Inkjet

RI. SE

- Roll to Roll

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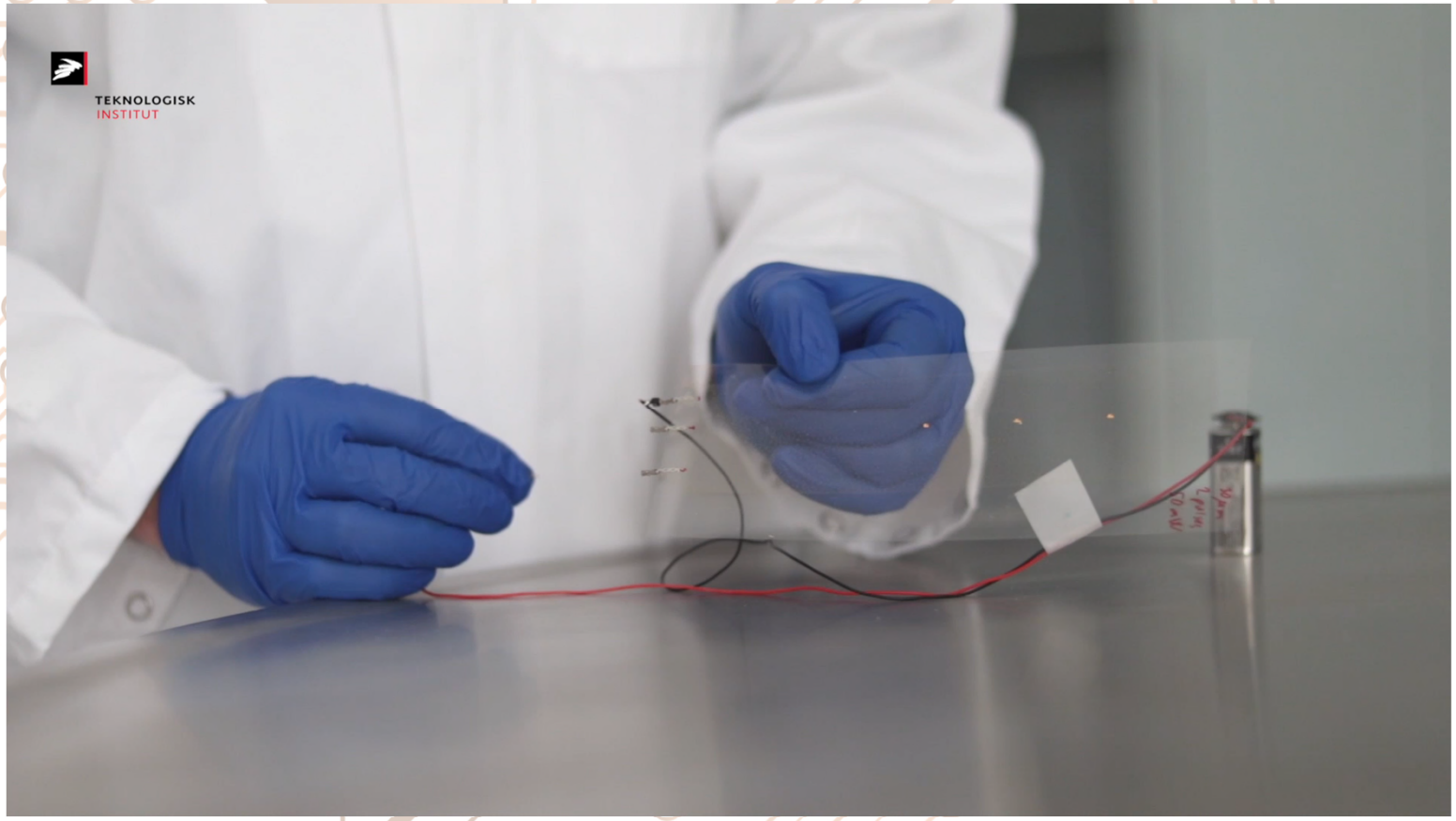
LEE-BED DEMOs

1st version crystal LED array



Invisable LED array using LEE-BED Ag nanowire based ink

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Challenge

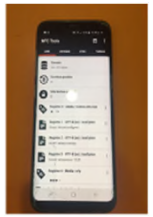
Structural health monitoring using externally bonded cable sensors

Cable sensor

LEE-BED solution

Embedded wireless sensors

LEE-BED sensor



wireless - communication

Sensor embedded within the laminate

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Phase 3: Knowledge transfer

IPR & patenting

Standarisation/ safety

Business planning

Investor capitol

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More information

- Services and pilot lines
  - Webinar 1 - LEE-BED: How to become part of the future with printed electronic – YouTube
  - Webinar 2 - LEE-BED: Nanomaterial pilot lines – YouTube
  - Webinar 3 - LEE-BED: Formulation pilot lines – YouTube
  - Webinar 4 - LEE-BED: Component pilot lines – YouTube

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LEE-BED open call

- 10 phase 1 assessments free of charge
- Goto www.lee-bed.eu and signed-up Today!!
- Review of applicants until Sept. 2021
- Run 10 phase I assessments until June 2022.

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Phase 1 process

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Contact via SEP
www.lee-bed.eu

1

2

Project manager following through all Lee-Bed phases

3

Technical feasibility and quick financial decision support

4

Services on safety, LCA, IP, and economic viability

5

Compliation of one final report document

Phase 2 & Phase 3

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Thank you

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