

Technologies portfolio

INNPAPER Open Call



INNPAPER

1 VTT

VTT Technical Research Centre of Finland Ltd is a state owned and controlled non-profit limited liability company established by law and operating under the ownership steering of the Finnish Ministry of Employment and the Economy. VTT is an RTO whose activities are focused on three areas: **Knowledge intensive products and services, Smart industry and energy systems, and Solutions for natural resources and environment.** VTT is impact-driven and takes advantage from its wide multitechnological knowledge base to strengthen Finnish and European industrial competitiveness. VTT can combine different technologies, produce information, upgrade technology knowledge, and create business intelligence and value added for its stakeholders. VTT has a staff of 2128, net turnover in 2016 was 162,6M€ and other operational incomes were 86,4M€. Over the years, VTT has gained vast experience from participation and coordination of numerous European projects including R&D Framework Programme projects and other thematic frameworks and programmes. VTT is ranked among the leading European RTOs.

1.1 Pilot-line for multifunctional paper

VTT is a partner in a recently established BIOECONOMY Research Infrastructure (RI) alliance with Aalto University (<http://www.bioeconomyinfra.fi/>) which **combines forest- bio and chemical process technologies.** BIOECONOMY RI contains complementary research infrastructure of both partners and the facilities especially for the development of novel fibre products and materials from renewable biomass. This enables the implementation of top science to demonstrations of new bio-based technology concepts.



VTT has extensive know-how on **process development and up-scaling of manufacturing processes** from laboratory to pilot scale. Nano- and microfibrillated cellulose grades with and without chemoenzymatic pretreatments can be produced using **microgrinders and microfluidizers** ~10kg/day (dry). VTT has **unique roll to roll pilot coating** research

environment (SUTCO) for production, development and testing of novel nanocellulose films and their surface modifications. The **surface characterization** (AFM, SEM, contact angle and surface energy, profilometers) is employed to evaluate all kinds of paper/CNF surfaces. VTT is active in **IC fabrication, MEMS, radiation detectors, thin films, RF technologies, superconductors, nanoelectronics, nanophotonics, nanobioelectronics and printed electronics.** The facilities include a **1900 square meter clean room** of which 550 square meters is of class 10, equipped with 150mm wafer processing line for BiCMOS and MEMS devices, thin film devices, nanoelectronics and micro and nanophotonics, wafer bonding, thinning and polishing processes, ebeam lithography up to 200 mm wafers, ALD and nanoimprinting lithography.



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2 CIDETEC

CIDETEC is a private organization for applied research founded in 1997 that seeks to contribute value to companies by harnessing, generating and transferring technological knowledge. Located in the Donostia-San Sebastián site of Gipuzkoa's Scientific and Technological Park, CIDETEC is comprised of three international technological reference institutes in energy storage, surface engineering and nanomedicine.

Each institute has its own offices and installations furnished with top-of-the-line equipment, among them **a pilot plant for integrated battery manufacture**; equipment to synthesise, characterise and process polymers and advanced composites; laboratories completely equipped for surface study, characterisation and treatment; and 150 m² of rooms classified and prepared for GMP-standard product manufacture in the biopharmaceutical sector.

CIDETEC currently employs a workforce of 183, 95% of whom are university graduates and 45% PhD holders. Its volume of activity came up to € 13M in 2019.

2.1 Pilot-line for inks formulation and printability pre-testing

The pilot line consists of the following equipment:

- 1) For inks/slurries formulation:
 - The pilot line consists of the following equipment:
 - 1 L mixer for slurry fabrication: Planetary mixers, 5&15 litre slurry sizes.
 - Batch double-walled glass reactors for wet chemistry (up to 20 L),
 - Drying facilities;
 - Nanomaterial dispersion facilities (e.g. rotor stator-based (100 mL, 500 mL and 50 L); bead mill);
 - 25 sqm dry room (D.P. -60°C) and several glove boxes (Ar, < 1ppm O₂ & H₂O)
- 2) Complementary equipment for fast verification of the developed formulations:
 - Rheology characterization: rheometer TA AR2000EX.
 - Screen printer THIEME 1010E for pre-testing of the printable inks/slurries.
 - Material characterization: UV/Vis/NR spectrophotometer, FTIR, TGA, etc.



15 L mixer
(for cathode slurry fabrication)



Rheometer



Screen-printer



3 CEA-LITEN

Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA) is a French research-and-technology organization with activities in energy, information technology, healthcare, defense and security. CEA-Tech, which is one of its divisions, focuses on **creating value and innovation through technology transfer to its industrial partners**. It employs 4,500 scientists and engineers including 300 Ph.D. students and 300 assignees from partner companies. CEA-Tech owns more than 2,200 patent families. Two departments of CEA-Tech are involved in the INN PAPER proposal, LITEN-Printed electronics & LETI-Health.

LITEN- Printed electronics is a multi-disciplinary team of more than 40 persons devoted to **printing process development for organic devices, ink formulation, organic device modeling and simulation and device reliability**. This department operates the French printing pilot platform PICTIC.

3.1 Pilot-line for printed electronics



The PICTIC platform is opened to industrial partners, especially SMEs and start-ups to foster TOLAE products to enter the market. It is **designed to the scale up printed devices from laboratory level TRL3-4 to products prototypes TRL 6-7**. The portfolio of

devices is large going from printed sensors and actuators, printed photodiodes, printed micro-fuel cells to printed TFT for backplane and logics. The platform is **600m² clean room class 10000** working on **Sheet-to-Sheet mode and is compatible with rigid and flexible substrate** up to 320mm x 380mm. It includes a complete set of industrial coating, printing equipment and characterization tools such as slot die, screen printer, inkjet, gravure printer, flexography tools, profilometer, ellipsometer. PICTIC is part of the EU COLAE project which integrates all the similar EU platforms. This platform is already used by CEA spin-off ISORG for small series production of their first printed organic photodetectors devices.

TOLAE Process in CEA:

- Front-end activities: 320X380 mm S2S PICTIC pilot line for prototyping (Slot die, screen printing, Ink jet / Aerosol jet, Flexo/ Heliography, Vacuum drying, Surface & Plasma treatment, laser ablation).
- Back-end/Integration activities: Encapsulation, Lamination and laser dicing, packaging, assembly
- Characterization & Yield Analysis:
 - Automatic electrical characterization (statistics over 100-1000 Devices)
 - Automated Optical Inspection & Printing profile analysis
 - Ageing & climatic controlled test bench
- Printed circuits Design Platform (DTK Cadence environment Model & Design Tool Kit)



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