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Ph.D. thesis (2018-2021)
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Development of innovative and transparent Radio-Frequency devices based on nanocelluloses-silver nanowires hybrid system

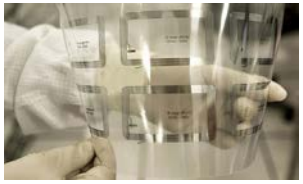
Système Passifs Radio Fréquences Innovants Transparents Hybrides de nanocelluloses et nanofils d'argent

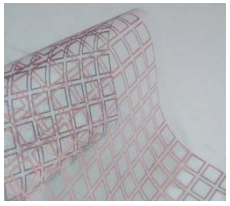
Context

Radio-frequency area

- Improvement of the security
- Development of IoT (Internet of Things)

Advantages of printing electronics





- Flexible
- Low environmental, production cost
- Additive methods

New market :

- Smart packaging
- Smart building
- Telecommunications
- Health

Funded by

In collaboration with IMEP-LaHC

Objectives

Conductive and transparent ink

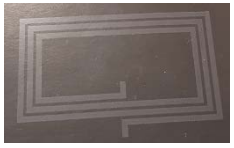
- Silver Nanowires
- Cellulose Nano Fibrils/ Nano Crystals
- Flexible Substrate : PET
- Sheet Resistance target : 100 mΩ.sq $^{-1}$
- Transparency > 85% @550 nm

Printing processes :

- **Screen printing**
- **Ink-Jet**

Development of demonstrator:

- Smart packaging
- RFID Tag
- Smart building
  - Amplificator
  - Shielding



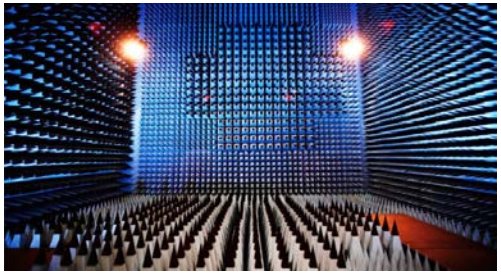
Methods

Surface characterization

- Morphological studies : SEM, AFM, Alicona
- Rheometer : viscosity, shear stress
- Influence of printing parameters : thickness, roughness, transparency, conducitivity, …

Radio-frequency

- Anechoic chamber



- Network analyser