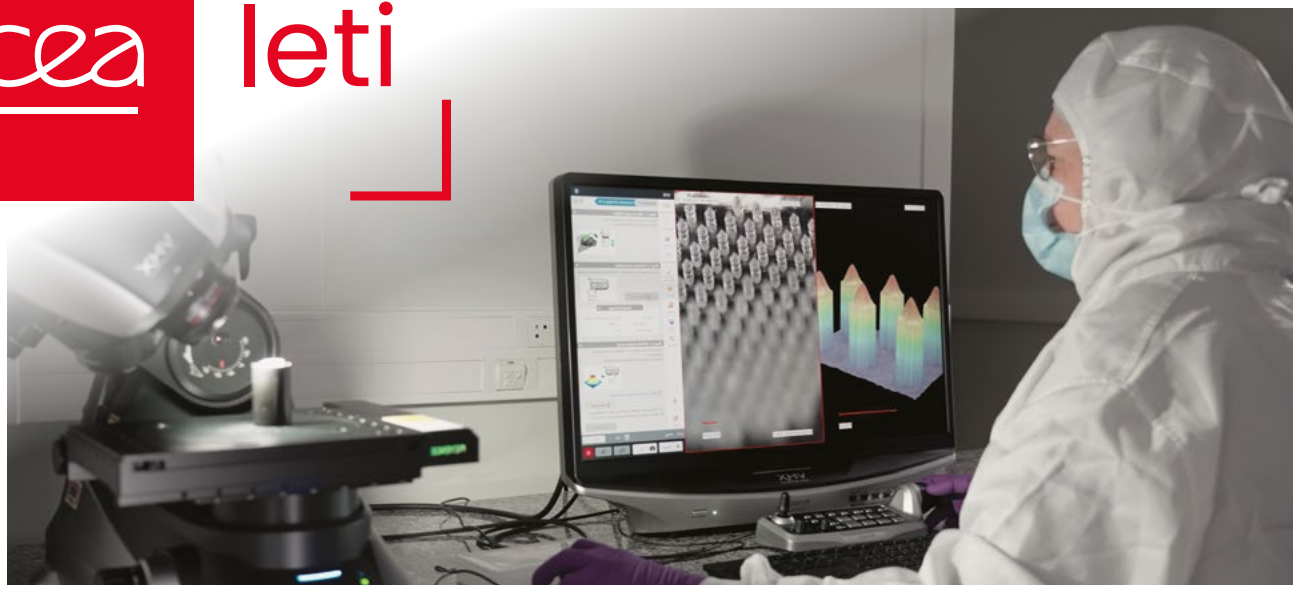
FRANÇAIS ENGLISH

cea leti



Smart micro-needles

4 PATENTS

Measure biological parameters and cure

What it is

Less invasive than traditional needles, micro-needles reach the deep layers of the epidermis to deliver drugs, measure physiological characteristics, or send light to specific wavelengths. CEA-Leti has developed and qualified a new technology of biocompatible polymer micro-needles, ranging in length from 250 µm to 1500 µm. Directly applicable to the skin, multiple assembly can cover several square centimeters.

What it can do

- Transdermal delivery of active ingredients: chemical drugs, proteins, nucleic acid, and vaccine formulations over short, medium, or long periods (3 min to several days)
- In-situ measurement of dermal parameters (pH, impedance)
- Interstitial fluid collection and electrochemical measurement of biomarkers (pH, glucose, lactate, cancer biomarkers, etc.)
- Optical waveguide for measuring and curing

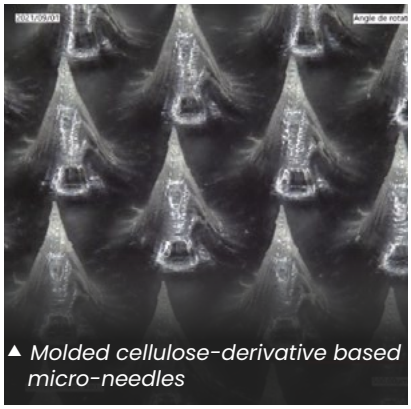
What makes it unique

Specialized in biomaterials and biosensing, CEA-Leti is able to monitor a broad range of biocompatible polymer or silicon materials to couple them with electrochemical, electrical or optical modalities in order to create smart micro-needles that can deploy electrochemical, electrical, or optical functions. CEA-Leti experts are working on several projects, from feasilibity studies, small-scale qualification to pre-clinical validation, such as:

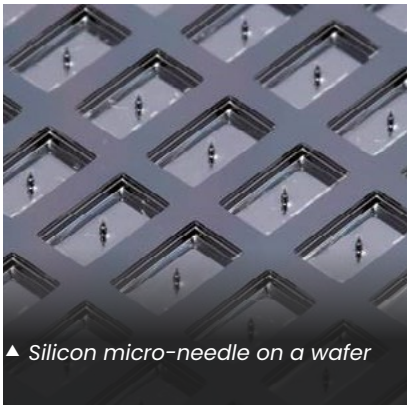
- Photosensitizer delivery (5-ALA) to treat melanomas, both easier and quicker to use for practitioners and less painful for patients
- On-demand insulin delivery using micro-needles coupled with a luminous actuator
- A preclinical study to check the performance of active micro-needles for local and deep anesthesia
- Hydrogel or hollow micro-needle to sample interstitial fluid for diagnostic

Publications

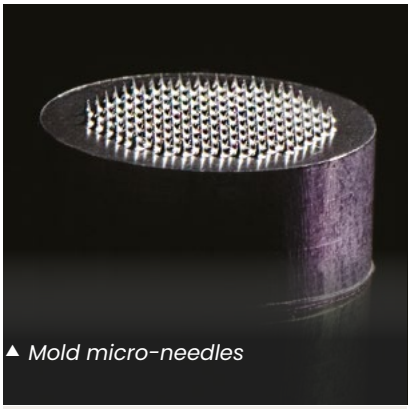
- "A facile fabrication of dissolving micro-needles containing 5-aminolevulinic Acid", Int. J.Pharm. 586, 119554, 2020
- "Introduction of a model of skin lesions on rats and testing of dissolving micro-needles containing 5-aminolevulinic", Int. J.Pharm. 594, 120115, 2021
- "Innovative transdermal delivery of insulin using gelatin methacrylate-based micro-needle patches in mice and mini-pigs", Nanoscale Horiz. 7, 174-184, 2022



▲ *Molded cellulose-derivative based micro-needles*



▲ *Silicon micro-needle on a wafer*



▲ *Mold micro-needles*

What's next

Several preclinical projects are underway to develop micro-needles devoted to wearable measurement, combining interstitial liquid collection with electrical, electrochemical, or optical measurements. These systems will pave the way to continuous monitoring of several metabolites involved in various pathologies. Large-scale manufacturing processes are also being developed.

Interested in this technology?

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