

Microprobe for selective electroporation and manufacturing method of such a microprobe

Who are we?

Łukasiewicz – Institute of Microelectronics and Photonics, based in Poland (Warsaw), is a part of Łukasiewicz Research Network – one of the largest European organizations for applied research. Łukasiewicz – IMiF operates under the formula Science is Business and its strategy is to play a central role in the innovation process towards R&D for industry and business. Fiber optic technologies are developed by our Photonic Materials Research Group, which conducts research activities on the development of new fiber optic structures, micro-optical elements, transparent ceramics, bioactive ceramics/glasses and special glasses including active glasses.

Patent information

**Technology
readiness
level:
2–3**

Title: Microprobe for selective electroporation and manufacturing method of such a microprobe

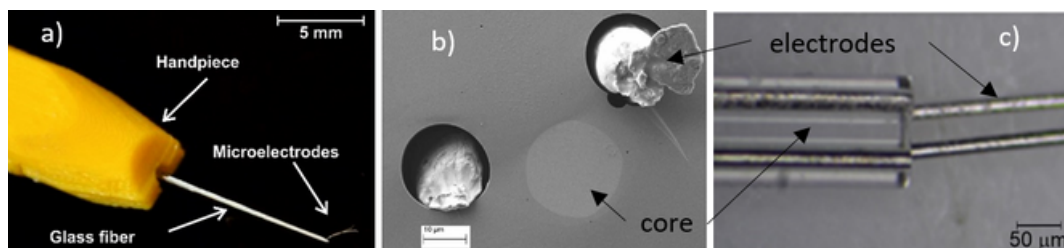
Patent number: US10322280, EP3011995, Pat. 226157

Priority Date: 21.10.2014

Inventors: Ryszard Buczynski, Dariusz Pysz, Ryszard Stępień

Jurisdictions: United States of America, France, Great Britain, Germany, Switzerland, Poland

Subject of the invention is a fibre microprobe for selective electroporation of cells regions of internal organs in vivo and single cells in vitro. Microprobe is an integrated device with channel for local drug delivery, imaging channel for observation of target cells or delivery or receiving of illuminating or therapeutic signal. Subject of the invention is also method of manufacturing of such a microprobe. Microprobe contains at least two metal electrodes with diameters of 20–30 μm immersed in a glass rod with maximum diameter of 500 μm . Glass rod isolate electrodes from each other and from surrounding environment allowing to create electrical field next to target cells that opens cells membrane.



Thin glass fiber microprobe for electroporation of selected cells: a) entire device; zoomed electrodes and high refractive index core b) front view and c) side view [1].

The potential behind the technology

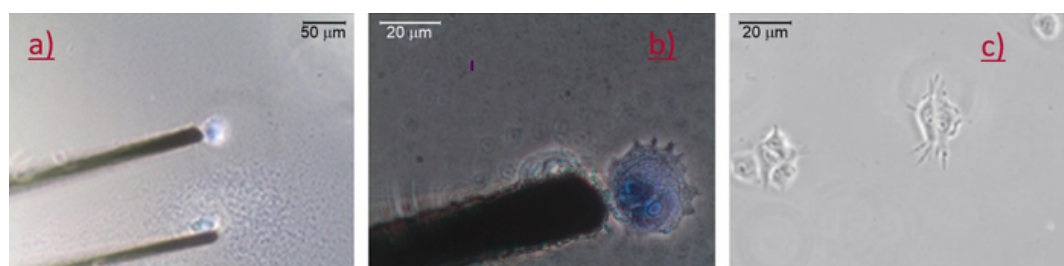
The fibre microprobes open new possibilities in electrochemotherapy techniques. These would combine selective, localized action and possibility to control this action by chemical, electrical and optical means. Such a solution allows e.g. delivering even the very toxic therapeutic agents to target cells without open surgery.

Technology Advantages

Currently, only macroscopic probes with needles or plates are used for electroporation. The therapeutic procedures with use of these tools are applied mainly for surface treatments, typically in skin cancer, or for in-vitro cell colonies without any selectivity. Our invention allows for selective electroporation of an individual cell in an in-vitro population, and also for electroporation of internal organs, being difficult to access with limited standard solutions.

Application

The microprobe according to the invention can be applied both in in-vivo therapy and in laboratory-based in-vitro research, enabling investigation of lipid membrane transport of eg. new types of drugs. Specifically, this new tool can in the future be applied in genethrapy and immunogen therapy for introduction of nucleic acids and in electrochemotherapy of tumors, in which drugs are introduced through electroporated cell membrane. This specifically applies to inoperable tumors in inaccessible locations, like the glioblastomas. Some malignant tumors localized in the brain or in pancreas have very poor prognosis with 2-5% chance of curing. This negative situation results from the difficulty of even inability to perform effective therapy on these tumors.



Cell membrane permeabilization verification with trypan blue (TB) staining after electroporation: a) electrodes next to the target cells before electroporation, b) cell in vicinity of the electrode after electroporation – TB localized in the cell, c) unaffected cells not stained with TB [1].



Collaboration type

License agreement or sale agreement

Grow Up Your Business With Us!

Are you interested in our offer? Please contact us for more information!

✉ komercjalizacja@imif.lukasiewicz.gov.pl

📍 **Łukasiewicz Research Network – Institute of Microelectronics and Photonics**
al. Lotników 32/46, 02-668 Warsaw

🌐 <https://imif.lukasiewicz.gov.pl/>