

ANMELDUNG | SCHUTZ | VERWERTUNG



### Focus Sectors

- Neurosciences
- Confocal microscopy
- Neuron stimulation
- Nerve stimulation

### Project Key Words

- Nanoscaled Schottky photovoltaic cells
- Targeted stimulation and inhibition of individual neurons
- Up to three-dimensional networks
- Adaptability to different cell membrane interactions

### Development Status

- *Concept and preliminary experiments*

### Patent Procedure Status

- Patent application filed

### Chances for Cooperation

- Licensing
- R&D Cooperation
- Patent right transfer

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## The last step in neurosciences

### Miniaturized photovoltaic cells for the study of large-scale neuronal networks in up to three dimensions

#### Innovation and Customer Benefit

Electrical stimulation of neurons is a key tool in neurosciences. Exciting fields, as consciousness generation, require the study of neuronal networks involving thousands of cells.

Several solutions have been used so far, with important limitations:

- Patch-Clamp and metallic electrodes are limited to two-dimensional, small groups of neurons;
- The more modern Optogenetics allows the study of three-dimensional, large neuron networks, yet with high effort and using complex chemicals.

Our invention offers important advantages over the existing techniques:

- No wiring needed
- Independent cell stimulation and stimulation of neurons & nerve networks
- Simple to produce, miniaturize and functionalize cells
- Sufficient voltage production for neuron stimulation and inhibition

#### Potential applications

Our technology presents Schottky photovoltaic cells for the stimulation of neurons and nerves.

Schottky cells act as solar cells and are able to produce enough voltage to stimulate neurons.

The surface functionalization of Schottky cells allows the targeting of neurons and nerves.

The versatility of this technology also allows its application on nerve stimulation, thus providing a new tool in this therapy field.

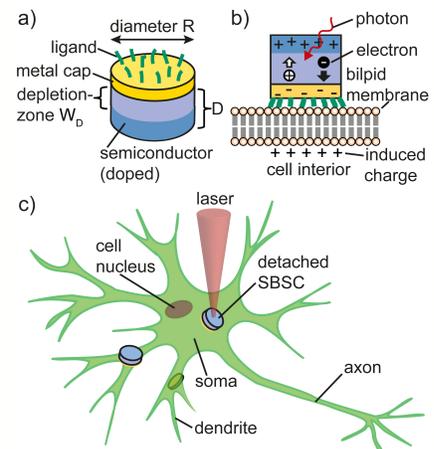
#### Technical Description

The Schottky cells introduced by this invention allow the targeted stimulation and inhibition of neurons and nerves in up to three dimensions.

The composition and size of the cells can be adapted to the target considering endocytosis, inter-cell mobility, biocompatibility and light absorption efficiency.

Customized planar arrays of Schottky cells and detached Schottky cells can be fabricated by using standard lithography steps.

Since the presented photovoltaic cells are autonomous units, individual neurons can be stimulated or inhibited, according to polarity, by means of a focused laser light, e.g. from a confocal microscope.



**Fig. 1:** a) Possible design of a Schottky cell, b) Concept of interaction between a Schottky cell and a neuron and c) Three-dimensional targeting of a neuron by detached Schottky cells and their polarization with a confocal microscope.