JOHANNES KEPLER UNIVERSITÄT LINZ

PHYSIKKOLLOQUIUM

Fachbereich für Physik

Im Rahmen des Physikkolloquiums spricht

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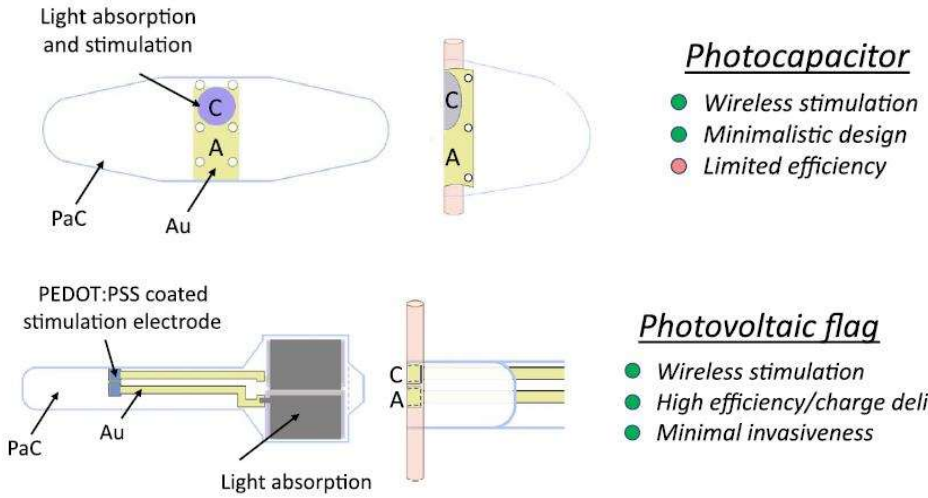
über

Transcutaneous stimulation of the central and peripheral nervous systems using implantable organic semiconductor devices and deep-red light excitation

Abstract:

Great demand exists for minimally-invasive neuromodulation technologies to enable next-generation bioelectronic medicine. We report on our developments of ultrathin (opto)electronic devices for neurostimulation. All of these devices rely on far red/near infrared irradiation in the tissue transparency window to actuate nanoscale organic semiconductor components. Our flagship technology is the organic electrolytic photocapacitor (OEPC) – a device that mimics biphasic current-pulse neurostimulation and thus transduces an optical signal into directly-evoked action potentials in neurons. These devices are not only wireless, but also 100-1000 times thinner than existing technologies. We will discuss examples of chronic implants capable of stimulating peripheral nerves, the cortical surface, as well as deeper brain structures. Light power can be safely and effectively transmitted to implants up to 15 mm below the skin surface, and effectively penetrates the scalp and skull. We believe that the combination of deep red light and ultrathin photovoltaic devices can account for a new paradigm in wireless bioelectronic medicine.



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Short Bio – E.D. Głowacki

Eric Głowacki studied chemistry at the University of Rochester, USA, completing BSc and MSc degrees in *materials chemistry* (2009).
He worked on optoelectronic materials, completing an MSc project with Ching Tang at the Kodak Research labs working in organic light-emitting diode display technologies.
In parallel, he studied history, earning a dual degree in Central European studies in 2009.

He completed his PhD in 2013 at the Johannes Kepler University in Linz, Austria,
under Prof. Sariciftci at LIOS, specializing in flexible electronic devices and biocompatible semiconductors.

He continued as a postdoc in Linz (2013-2016), with research interest moving into the field of electrophysiology and particularly optoelectronic stimulation of excitable cells, an idea leveraging know-how on thin film biocompatible semiconductors.

In 2016, he moved to set up and independent group at Linköping University in Sweden, within the Wallenberg Center for Molecular Medicine, working on microfabricated neurostimulation devices.

In 2020, he was awarded the ERC Starting Grant, with which he moved his group to CEITEC, Brno University of Technology.

At present, he leads the *Bioelectronics* research group at CEITEC, which conducts fundamental research, as well as applied collaborations with companies.
His research is dedicated to neural interface technologies and bioelectronic medicine, as well as fundamental research in neuromodulation and reactive oxygen in physiology.

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