



CEITEC
BRNO UNIVERSITY
OF TECHNOLOGY

ADVANCED MATERIALS AND NANOTECHNOLOGY

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Prof. Janos VÖRÖS

ETH Zurich, Switzerland

Microstructured nanocomposite materials for bioelectronics

MARCH, 27

Tuesday, 10:00

Seminar room S2.02
CEITEC BUT, Purkynova 123

A new class of electronic devices based on stretchable materials can interact with the soft human body in an unprecedented manner. They are highly suitable for epidermal electronics because they can be designed to conform closely to and with the irregular shape of the skin, providing an improved functional interface even during motion, while being imperceptible to the user.^{1,2}

But does the stretchability also provide benefits for in vivo applications?

The second part will introduce our progress on using metal nanowires embedded in PDMS that can be processed using screen-printing or regular photolithography to create stretchable conductive leads down to 10 micrometer resolution. The process parameters, e.g. type of PDMS, nanowire concentration and arrangement allow for precise tailoring of the electrical and mechanical properties of this composite material. Stretchable and biocompatible microelectrode arrays can thus be realized that enable stimulation of intact spinal cord circuits below an injury to control the movement of the limbs aiding rehabilitation and increasing recovery of spinal-cord injured patients³; and enable the recording of in vivo electrical signals⁴.

The technology also allows for creating devices with up to 500% stretchability or with Gauge factors of over 100.5 A novel fabrication method has been developed to produce various opto-electronic components using wax-pattern assisted filtration. These devices are soft and made of biocompatible materials therefore they are ideal for in vivo applications. For example, LED and electrode arrays can be used to stimulate the brain of optogenetically modified mice or rats, respectively.⁶ (See figure below.) In addition, smart and passive RFID tags can be created to measure the filling level of the bladder in handicapped users.⁷