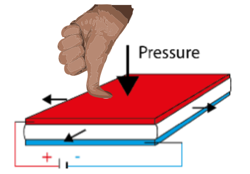
Technology opportunity | Dielectric Elastomer Nano-Transducers

eSKIN - Electronic Skin for Human Machine Interfaces

University of Basel

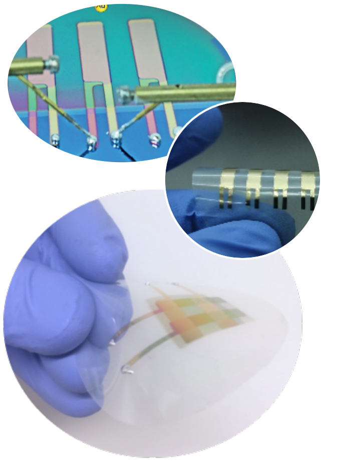
Challenges

Currently available force and pressure sensors for medical applications fail to mimic the skin`s natural capabilities of force detecting due to **rigidity** and **lack of biomimetic elastic properties**. Geometrical restrictions limit their adaption to the given medical device. Moreover, the interplay of the electronic properties often lead either to **low sensitivity**, **restricted response time** or **high power consumption**. Finally, operation at **medically approved voltages of a few Volts** is required to be integrated on medical implants.

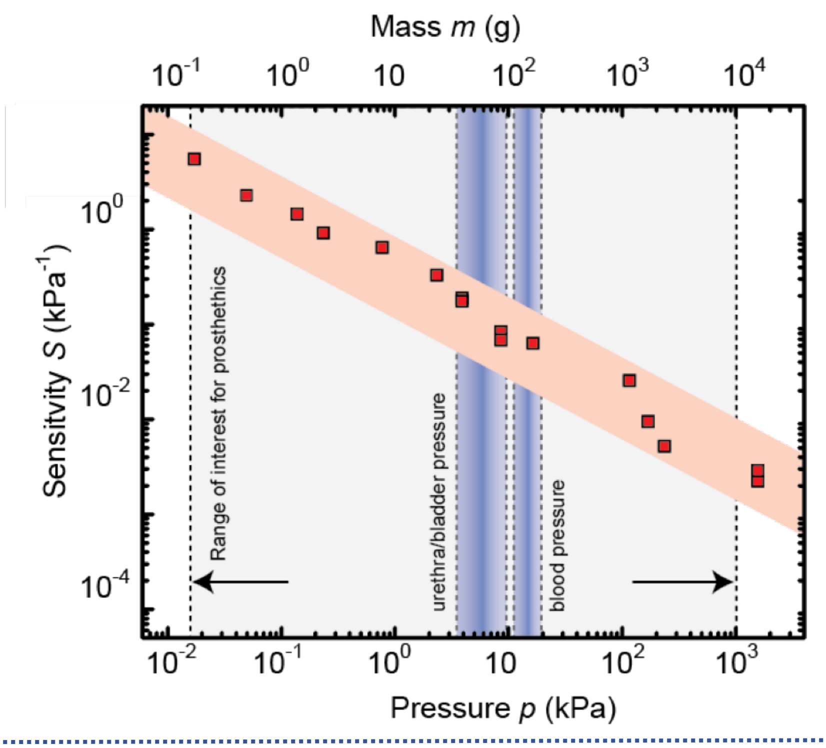


Solution

Robust and compliant sensors based on dielectric elastomer transducers (DETs) are **operated at voltages below 1 V and** offer the possibility **for static/dynamic pressure sensing**. Fabricated on **soft** polymer substrates they can be directly attached to the skin or implant surface for real-time monitoring with **millisecond time resolution** of diverse human physiological signals and body motions for wearable healthcare and patient rehabilitation. The capacitive sensor is based on a polydimethylsiloxane (PDMS) elastomer layer embedded between two flexible electrodes. Our unique thin-film technology reliably enables the fabrication of sub-micrometer thin elastomer and electrode films. When external pressures are applied, the induced deformation of the dielectric layer causes a change of capacitance. **Sensitivities above 10kPa^{-1}** are adjusted to the **physiological pressures of interest (Pa to MPa)** by multilayered specifically tailored nanostructures. The **high resting capacitance** of hundreds of pF/cm^2 enables **simplified micro-electronics**. Combined with the overall thickness below 20 µm our dielectric elastomer sensors (DES) implies **no geometrical restrictions** to medical devices/implants. It's **low energy consumption below 1nW** combined with **self-healing capabilities will** enable **long-term stable** sensing solutions. In addition, sensor pads with spatial resolution of one sensor per mm^2 can be cut by the surgeons adapted to the required **individual shape** of the patients implant.



Data sheet



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