"Dielectric elastomer transducers for artificial skin and muscles"

Dielectric elastomer transducers (DET) exhibit a strain-stress behavior comparable to human tissues. Their efficiency to convert electrical energy into mechanical one is outstanding, e.g. as "artificial muscles" they are established in soft robotics. The use for medical implants, however, requires a reduction of the operation voltage by at least two orders of magnitude. Dielectric elastomer actuators based on elastomer layers several hundred nanometers thin have generated 6 % strain applying voltages as low as 12 V and thus, have gained international interest within the community of electro-active elastomers. However, thousands of nanostructures would have to be stacked realizing the force comparable to natural muscles. Currently, a *Bridge-Proof of Concept* project, lead by Dr. Tino Töpper at the *Biomaterials Science Center*, focuses on the sensing capability of the DETs, fabricated by organic molecular beam deposition. Finally, these highly flexible DETs will serve as force-feedback sensor directly integrated on medical implants as "artificial skin". These high-performance multi-layer sensors will remain operational even if one or the other layer fails due to breakdowns. With millisecond time response the functionality of artificial sphincters implants (MARS, Dr. N. Dhar, Wayne State University) for incontinence treatments will be significantly enhanced. The first dielectric elastomer sensor prototype has been successfully designed and presented
at the SPIE-Smart Materials meeting, Denver, U.S., march 2018,
see video: https://tube.switch.ch/videos/95778e8c

Project information

The project and research facility is placed within a highly interdisciplinary environment of chemists, physicists, biologists and engineers.
Your tasks will include the fabrication of gold/silicone nanostructures by electro-spray deposition as well as their characterization especially their morphology by atomic force microscopy and their electrical properties by four-point and dynamic capacitance measurements.
The output of your work is intended to result into a conference contribution at the SPIE-Smart Materials meeting, March 2019.
The timeframe of includes master as well as project thesis for six and three month experimental lab work.

For more information please don't hesitate to contact us:
tino.toepper@unibas.ch

University of Basel
Department of Biomedical Engineering
Biomaterial Science Center
Gewerbestrasse 14
4123 Allschwil, Schwitzerland
https://bmc.unibas.ch