MASTER thesis

NANOSCIENCE / PHYSICS

Earliest starting date: ***Feb./March 2020***

Nano-structuring of dielectric sensors for tongue-machine interfaces as Anti-snore trainer

BACKGROUND

Adequate sleep is a key part of healthy lifestyle and essential for your mind's fitness. Every second person worldwide, however, is affected by disruptive snoring and sleep apnea – in more than 30% directly related to a lack of tongue muscle control. Current anti-snore treatments are either based on passive mouthguards or costly custom-made devices, which exhibit poor efficacy and lack scientific validation. Finally, uncomfortable designs, the burden at night and low motivation to change the life-style lead to early drop-out rates as high as 70%. A unique polymer nanotechnology for ultra-thin pressure sensors and stretchable electronics was developed and patented at the University of Basel, Biomaterials Science Center. The spin-off Bottmedical AG envisions to apply this technology for oral devices that

enable an inter-active training to increase the strength and the subconscious control of the tongue. The gamification should keep the patient's motivation and guarantee the successful execution of the therapy.

TECHNOLOGY

The intra-oral anti-snore device will be based on thermoformable & bio-based polymer materials embedding the dielectric elastomer sensors (DES).
A micrometer-thin DES film realizes a force feedback with a spatial resolution of four sensors per cm^2. The sensor prototype was first presented at the SPIE Smart Materials, EAP-in-Action Session, Denver, CO, U.S.A. in March 2018 [https://tube.switch.ch/videos/95778e8c]. The read-out frequency of 1 kHz corresponds to millisecond response of the integrated sensors showing sensitivities above 1 kPa^{-1} within the whole range of physiological pressures of interest (kPa to MPa) [PCT/EP2019/055157].

KEYWORDS

Bio-based polymers, thermoforming of multilayer polymer composites, plasma-induced nanostructures, hot-embossed microstructures, nanocoating

Project information

The project and research facilities are placed within a highly interdisciplinary environment at the interface between basic science (at University of Basel) and commercialization challenges (at Start-up Bottmedial AG). The framework of this master project is an collaborative Innosuisse project between the academic partners at EMPA Dübendorf,
Züricher Hochschule der Künste, UniversitätsSpital Basel
and Bottmedical AG.

Your tasks will include the (i) fabrication of micrometer-thin dielectric elastomer sensor by electro-spray deposition as well as (ii) the molding of sensor foils, (iii) their characterization especially, morphology by atomic force microscopy and their electrical properties including four-point and dynamic capacitance measurements.

The output of your work is intended to result into a conference contribution and is envisioned to take part within a prototype-based clinical trial at Universitätspital Basel in 2021 results.

The timeframe of the master project includes a minimum of six month experimental lab work within the labs at University and Start-up.

For more information please don't hesitate to contact us

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