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## ABSTRACT

### **Novel Conducting Polymers for Bioelectronics and Isolation of Cancer Biomarkers**

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Conducting polymers (CPs) have been widely used as electroactive biointerfaces, e.g. in tissue engineering and stretchable organic bioelectronics. In this talk, I will present two different approaches to electroactive biointerfaces based on conducting polymers. The first approach addresses the issue that electrodes used in tissue recording and stimulation are commonly 2D and made of solid conducting materials, and as such cannot fully probe the actual 3D cell environment within tissues and organs and/or have a significant mechanical mismatch with biological tissue. Our approach to overcome that is based on a precise fabrication of individually addressable, high aspect ratio, soft, 3D CP-pillar microelectrode arrays by means of 'direct 3D writing'. Such 3D microelectrode arrays could be employed in a variety of applications, from biological sensing to recording and electrically stimulating cells and tissues [1], with the design of the arrays being easily adjustable. The second type of electrochemically addressable biointerfaces that will be presented is based on flexible, microporous, electrochemically switchable membranes that can selectively and efficiently capture, and then non-destructively release, cancer biomarkers, such as cancer cells shed extracellular vesicles (EVs) [2] and rare cancer cells [3]. The platform allows for the EVs and cells to be captured from large volumes of complex biological samples and released into clean and small volumes of buffers - suitable for further analysis, for example, for medical diagnostics.

#### References:

[1] E. Tomaskovic-Crook et al, *Advanced Healthcare Materials*, 8, 1900425 (2019)

- [2] A. Akbarinejad et al., *ACS Applied Materials and Interfaces*, 12 (35) 39005–39013 (2020)
- [3] A. Akbarinejad et al., [doi.org/10.1002/admi.202102475](https://doi.org/10.1002/admi.202102475) (2022)