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Supporting Information

for *Adv. Healthcare Mater.*, DOI 10.1002/adhm.202202869

Printed Silk Microelectrode Arrays for Electrophysiological Recording and Controlled Drug Delivery

*Nouran Adly, Tetsuhiko F. Teshima, Hossein Hassani, George Al Boustani, Lennart J.K. Weiß, Gordon Cheng, Joe Alexander and Bernhard Wolfrum**

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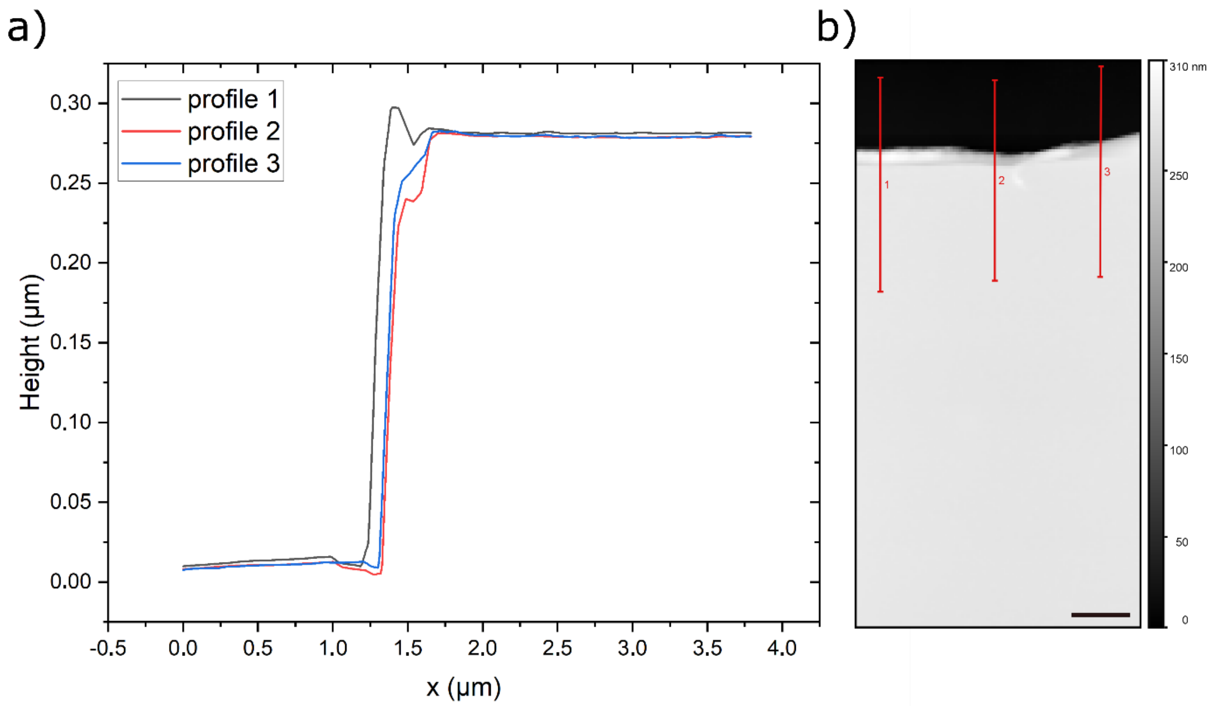

Figure S1: a) height profiles of untreated silk layer vs. the substrate, taken along the lines indicated in **(b)**, the AFM height map. (scale bar = 1 µm)

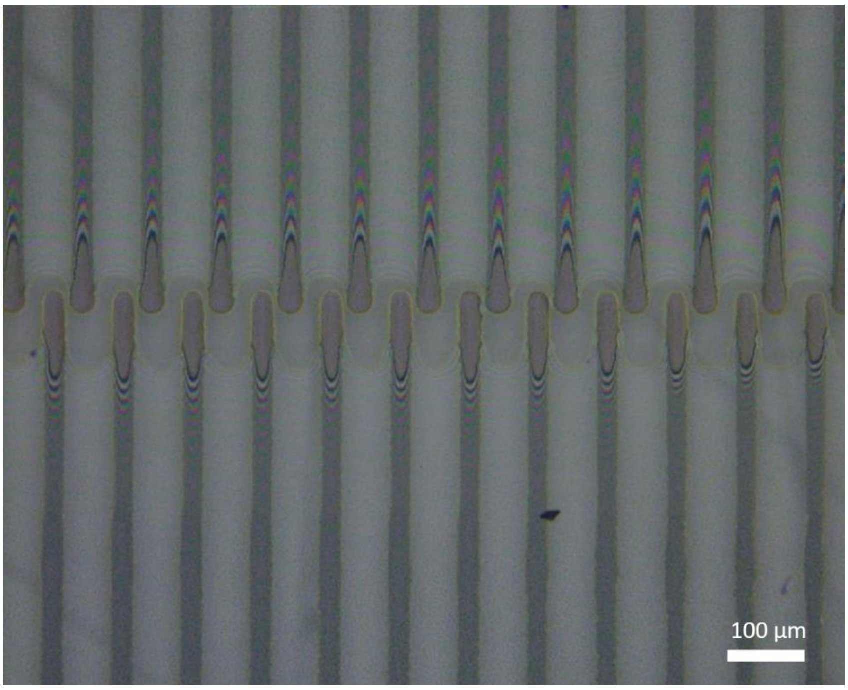

Figure S2: Microscopic image of the printed MEA on a silk substrate (scale bar: 100 µm)

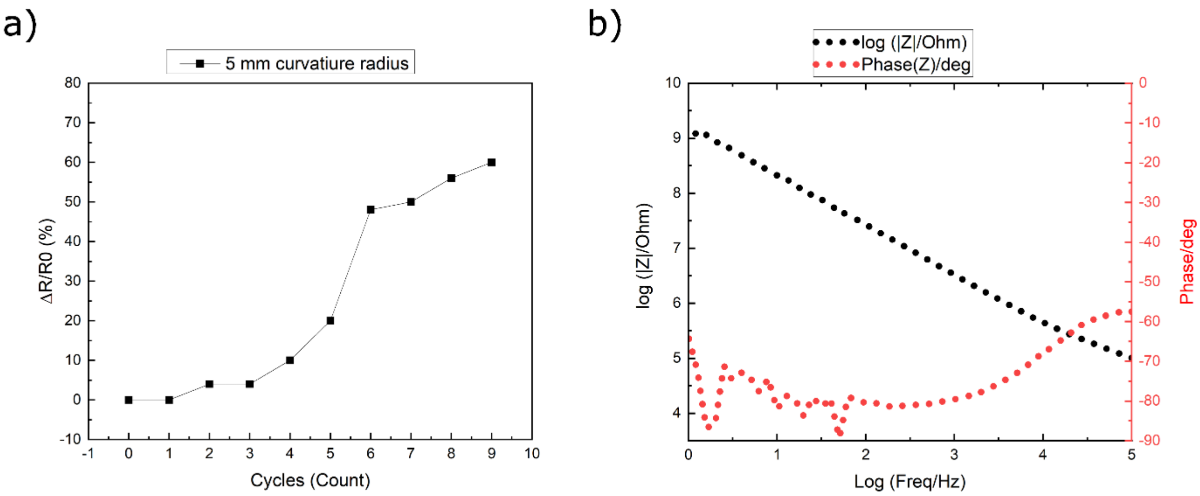

Figure S3: a) The bending stability of the silk-carbon electrodes; relative resistance as a function of bending cycles to 5 mm radius of curvature. b) Electrochemical impedance spectroscopy of a carbon microelectrode measured in PBS (electrode area ~2.5×10^3 μm^2).

Characterization of printed microelectrode arrays:

To assess whether the printed microelectrode devices remained stable upon bending, we measured the resistance of printed lines after repetitive bending experiment cycles. Hereby, the substrates were bent to a radius of 5 mm and then relaxed; this cycle was repeated several times, after which electrical characterization was performed. **Figure S3a** presents the relative resistance change, $\Delta R/R_o$, where $\Delta R = R - R_o$, with R and R_o being the resistance of the structure when bent and relaxed, respectively. As presented in **Figure S3a**, after a bending radius of 5 mm had been achieved over 4 cycles, a 10% increase in resistance was observed.

Figure S3b presents the typical Bode spectra measured in PBS for a printed silk carbon microelectrode.

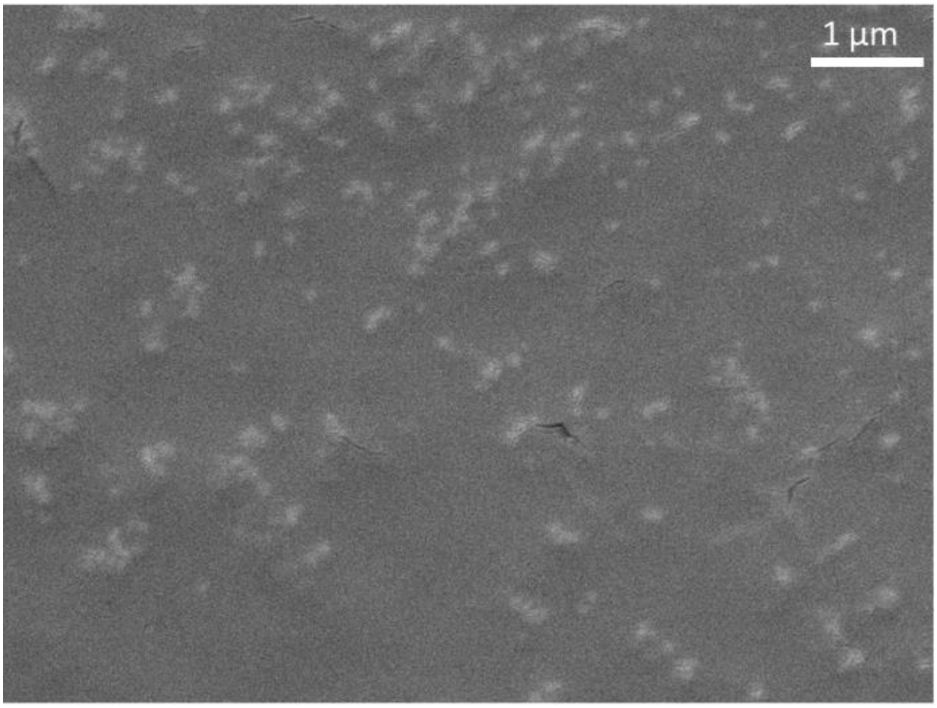

Figure S4: SEM image of printed SF-Carbon film without applying voltage

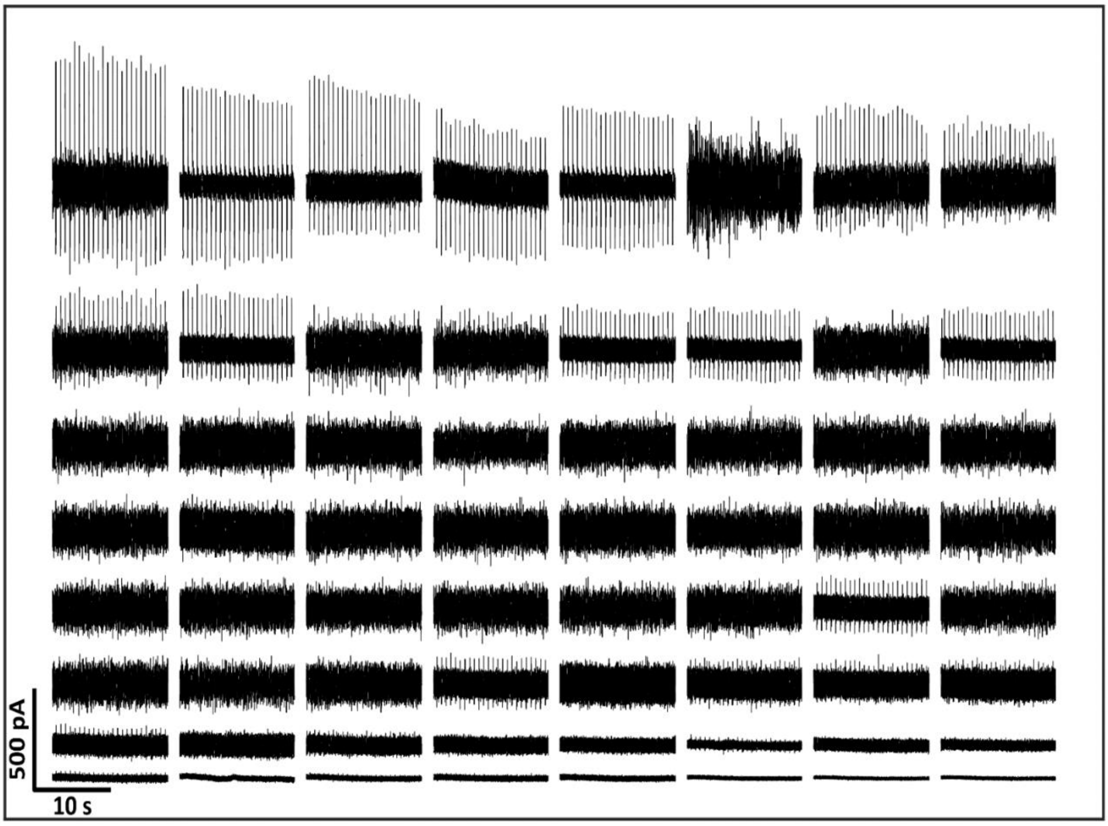

Figure S5: A representative recording from 62 recording channels of a single chip; recordings are organized according to descending signal amplitude.