**Supplementary Material**

Transparent Carbon Nanotube Electrodes for Electric Cell-Substrate Impedance Sensing

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**Fig S1.** The sheet resistances of different layers of SWCNT SDS-based films spray coated on treated-COP substrate. The measurements were done at room temperature and at 37 °C. n.s.=non-significant (n=15).

**Note:** In ECIS experiment, electrodes and array holder are kept at 37 °C and 5% CO2 during impedance measurements. Therefore, Rs of SWCNT SDS-based films were measured at RT and 37 °C to measure the effect of temperature on the conductivity of SWCNT electrodes. The Rs of all SWCNT SDS-based films decreased slightly when the temperature of the samples was increased to 37 °C. However, there were no significant differences between the sheet resistances measured at RT or at 37 °C in each SWCNT films (ρ>0.05). Therefore our measurements were performed at RT.

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**Fig S2.** The SEM images of (A-D) MWCNT SDS-based, (E-H) SWCNT SDS-based, (I-L) SWCNT CMC-based films spray coated on treated-COP foil. All the CNT films were imaged after removing the dispersants. The transmittance of each film is shown next to the label. The scale bars are 1 µm.

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**Fig S3.** Phase contrast images of (A) L929 cells cultured on a treated-COP substrate surrounded by SU8-2, (B) MCF7 cells grown on non-coated electrode array of SWCNT CMC-based films (269.9 Ω/sq at 72.8% transmittance), and (C) the cells in B were washed three times with PBS and most of the cells were detached from the surface.

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**Fig S4.** The phase contrast image of L929 cells on electrode array of SWCNT SDS-based film (693.7 Ω/sq at 65.5% transmittance) (A). The L929 cells growing on the surface of SWCNT film (B) the same position in part A with the camera focus on the SWCNT film. The scale bars are 100 µm.

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**Fig S5.** The fluorescence images of L929 cells cultured on SWCNT SDS-based film (693.7 Ω/sq at 65.5% transmittance) and treated-COP, both coated with SU8-2 photoresist. The blue line on the images is the border line between the SWCNT-coated region (below the line) and COP substrate (above the line). Image A is recorded with a green filter. Image B is imaged with a blue filter. The scale bars are 50 µm.

**Note:** The murine L929 fibroblasts (DSMZ, Braunschweig, Germany) were cultured on SWCNT SDS-based electrodes (693.7 Ω/sq and 65.5% transmittance). After one day, cells were fixed with formalin solution and subsequently permeabilized with PBS containing 0.5% Triton X-100® for 5 min. Blocking buffer (1% BSA in PBS) was added to the cells, followed by incubation in 0.5% BSA-PBS containing phalloidin (Alexa Fluor® 660 conjugate, Life Technologies, Germany) and DAPI for 1 h. Cells were washed and stored in PBS. Images were taken with a Nikon ECLIPSE Ti microscope.

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**Fig S6.** (a) The capacitance spectra and (b) the resistance spectra of MCF7 cells grown on gold working electrode and SWCNT CMC-based working electrode as a function of frequency measured 19 h after cell seeding for cell-free electrodes and cell-covered electrodes. The normalized (c) capacitances and (d) resistances of gold and SWCNT electrodes measured 19 h after cell seeding by capacitance division of cell-covered electrodes (n=4) to the cell-free electrodes (n=4).