Supporting Information

Poly(3,4-ethylenedioxythiophene)-Based Nanofiber Mats as an Organic Bioelectronic Platform for Programming Multiple Capture/Release Cycles of Circulating Tumor Cells

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Materials and Reagents

The PEDOT:PSS aqueous solution (Clevios PH1000) was purchased from H.C. Starck. Poly(ethylene oxide) (PEO; molecular weight: 900,000) and (3-glycidoxypropyl)trimethoxysilane (GOPS) were obtained from Sigma–Aldrich. PLL(20)–*g*–[3.5]-PEG(2)–FITC (PLL-*g*-PEG-FITC) and PLL(20)–*g*–[3.5]-PEG(2)/PEG(3.4)–biotin (50%) (PLL-*g*-PEG-biotin) were obtained from SuSoS. Streptavidin (SA, 1 mg) was obtained from Invitrogen. Biotinylated anti-human epithelial cell adhesion molecule (anti-EpCAM-biotin)/TROP1 antibody (Goat IgG) was obtained from R&D Systems.

Cell Studies

The cervical cancer cell line HeLa, the breast cancer cell line MCF7, the lung cancer cell line PC9, and the monocytic cell line THP1 were purchased from the Bioresource Collection and Research Center (BCRC, Taiwan). Fetal bovine serum (FBS) was purchased from HyClone. Gluta MAX-I, Vybrant DiO cell-labeling solution, DMEM, and RPMI 1640 growth medium were purchased from Invitrogen. 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES) buffer and Hoechst 33342 were purchased from Life Technologies.

Surface Modification on PEDOT-Based Nanofiber Mats

The device with a PDMS chamber was sequential incubated with PLL-*g*-PEG-biotin or PLL-*g*-PEG-FITC solution [100 μg mL^{-1} in 10 mM HEPES buffer (pH 7.4)] for 1 h; SA [10 μg ml^{-1} in 1× phosphate-buffered saline (PBS)] for 1 h; Biotinylated anti-human EpCAM/TROP1 antibody [10 μg ml^{-1} in 1× PBS with 0.1% bovine serum albumin (BSA)] at room temperature for 1 h. Finally, the 3D PEDOT–based BEI devices were washed at least three times with 1× PBS, and then immersed in 1× PBS more than 1 h before performing the cell experiments.

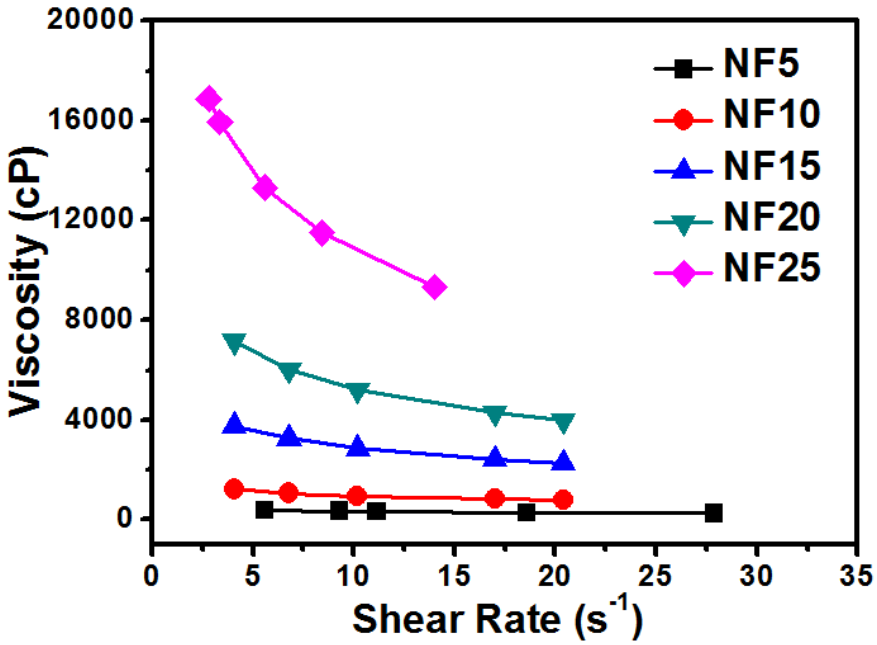

Figure S1. Viscosity of nanofibers compositions **NF5**, **NF10**, **NF15**, **NF20**, and **NF25** plotted with respect to shear rate.

Shear Viscosity Test

Different nanofiber batches **NF5**, **NF10**, **NF15**, **NF20**, and **NF25** were subjected to viscosity versus shear tests. The viscosity in each batch decreased substantially upon increasing the shear rate at low shear rate intervals. At lower shear rates, **NF10** exhibited the most Newtonian behavior among the batches of nanofibers. These preliminary results provided an initial impetus to continue the study of CTC cell detection and isolation using **NF10**.

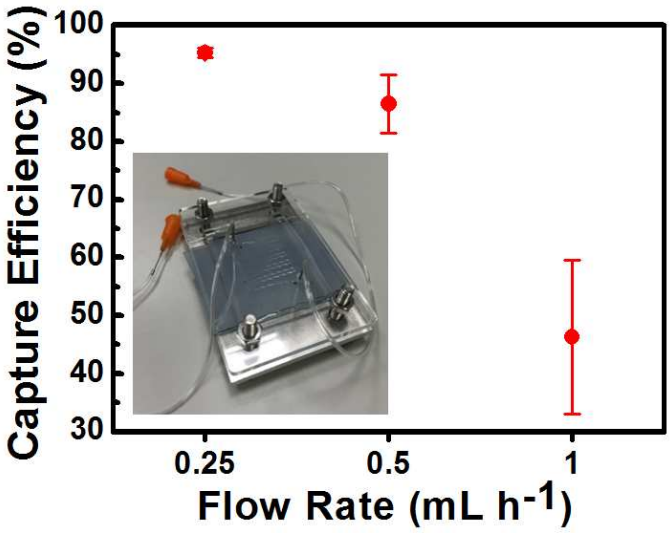

Figure S2. Cell-capture efficiency of the microfluidic BEI device incorporating **NF10** nanofiber mats, measured at flow rates of 0.25, 0.5, and 1 mL h^{-1}; error bars: standard deviations (n = 3); THP1 cell suspensions (10^6 cells mL^{-1}, 1 mL) containing MCF7 cells (500 cells mL^{-1}) were employed as a model system; (inset) image of the microfluidic BEI device incorporating **NF10** nanofiber mats for the capture, release, and recapture of CTCs from artificial liquid biopsy samples.