

A High-performance PEDOT:PSS Platform Electrochemical Biosensor for Determination of HER2 Based on Carboxyl-Functionalized MWCNTs and ARGET ATRP

Supplementary Material

Materials and reagents

HER2-antigen, HER2-antibody and HER2-apramer (Apt: 5'-SH-(CH₂)₆-GCAGCGGTGTGGGG-3') were purchased from Shanghai Sangon Biotech Co., Ltd and stored at -20 °C before use. Poly (3,4-ethylenedioxythiophene)-poly (styrenesulfonate) (PEDOT:PSS) and DMSO were provided by Macklin Biochemical Co. Ltd. (Shanghai, China). H₂AuCl₄·4H₂O were purchased from Aldrich Bio-Chem Technology Co., Ltd. (Shanghai, China). Ferrocene methyl methacrylate (FMMA), 2-bromo-2-methylpropionic acid (BMP), tris(2-dimethylaminoethyl) amine (Me₆TREN), bovine serum albumin (BSA), N-(3-dimethylaminopropyl)-N'-ethylcarbodiimide hydrochloride (EDC), N-hydroxysuccinimide (NHS), and normal human serum were obtained from Sigma-Aldrich Trading Co., Ltd. (Shanghai, China). Copper (II) bromide (CuBr₂) was provided by Sinopharm Chemical Reagent Co., Ltd. (Shanghai, China). Ascorbic acid (AA) and Lithium perchlorate trihydrate (LiClO₄·3H₂O) were ordered from J&K Scientific Ltd. (Beijing, China). Potassium ferricyanide (K₃[Fe(CN)₆]) and potassium hexacyanoferrate (K₄[Fe(CN)₆]) were obtained from Lingfeng Chemical Reagent Co., Ltd. (Shanghai, China). Multi-walled carbon nanotubes (MWCNTs) were acquired from Aladdin Reagent Co., Ltd. (Shanghai, China). KNO₃ was purchased from HengXing Chemical Reagent Co., Ltd. (Tianjin, China).

Phosphate buffered saline (PBS, 0.1 M, pH 7.4) was prepared by mixing NaH₂PO₄, Na₂HPO₄ and 0.9 % NaCl, and all the different concentrations of protein were diluted in 0.1 M PBS.

CuBr₂ and Me₆TREN were dissolved in DMSO to prepare Cu^{II}Br/Me₆TREN complexes, and the concentration ratio of CuBr₂ and Me₆TREN was 10 mM: 12 mM. The freshly prepared ARGET ATRP solution was obtained by adding 300 μL Cu^{II}Br/Me₆TREN (10 mM), 300 μL FMMA (10 mM), 300 μL AA (2 mM) and 2.1 mL PBS.

Apparatus

All experiments were conducted at room temperature. Multi-Potential steps (STEP), Cyclic voltammetry (CV) and square wave voltammetry (SWV) were carried out on a CHI760E electrochemical workstation (Shanghai CH Instruments Inc, China). Electrochemical impedance spectroscopy (EIS) was measured by an Autolab PGSTAT204 electrochemical workstation (Eco Chemie, Netherlands). Morphological images of the modified electrodes were obtained by atomic force microscopy (AFM, Bruker Nano Inc, USA) and transmission electron microscopy (TEM, JEOL Japan). The droplet shape analyzer-DSA100 (KRÜSS, Germany) was used to measure the water contact angle (WCA) of surface of electrodes after modification of different materials. Fourier transform infrared spectroscopy (FTIR) spectrum was obtained using an FTIR-Nicolet IS5 spectrophotometer (Thermo, USA).