Supporting Information Available

Enhancement of Selective Determination of the Perfect Match and Mismatch of Single Nucleobases with Biosensing Electrode Based on Surface-Coarsened Anatase TiO_2 Nanobelts

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Materials

Titania P-25 (TiO_2, ca. 75% anatase, and 25% rutile), sodium hydroxide (NaOH), hydrochloric acid (HCl), and sulfuric acid (H_2SO_4) were purchased from China National Medicines Corporation Ltd. Adenine (A), guanine (G), cytosine (C), uracil (U), and thymine (T) were obtained from Aladdin (Shanghai, China). Conductive adhesive was purchased from China Shenzhen Capiton Sci-Technology Co., Ltd. Ultrapurified (Millipore) water was used throughout this study. All reagents were of analytical grade.

Preparation of TiO_2 nanobelts

Titanate nanobelts were synthesized by a hydrothermal process in a concentrated

NaOH aqueous solution. Commercial titania powders (Degussa Co., P-25, a mixture of anatase and rutile at a ratio of 3 : 1) were used as the precursor. Briefly, 0.1 g of the P-25 precursor was mixed with 20 mL of a 10 M NaOH aqueous solution, followed by a hydrothermal treatment at 180 °C in a 25 mL Teflon-lined autoclave for 72 h. The treated powders were washed thoroughly with deionized water followed by a filtration and drying process, affording sodium titanate nanobelts, which were then immersed in a 0.1 M HCl aqueous solution for 24 h and washed thoroughly with water to produce hydrogen titanate nanobelts. These nanobelts were divided into two portions. One part was thermally annealed at 600 °C for 1 h, leading to the formation of TiO_2 nanobelts (TNs). The other part was put into a 25 mL Teflon vessel which was then filled with a 0.02 M H_2SO_4 aqueous solution up to 80% of the total volume, and heated at 100 °C for 12 h. The products were isolated from the solution by centrifugation and washed with deionized water for several times, and then dried at 70 °C for 10 h. The resulting cauterized TiO_2 nanobelts were denoted as CTNs.

Structure characterization

X-ray powder diffraction (XRD) patterns of the obtained TiO_2 nanobelts were recorded with a Bruke D8 Advance powder X-ray diffractometer with a Cu Kα source (λ = 0.15406 nm) at room temperature in the range of $2\theta = 10^o$ to 70^o. The morphologies and size of the TiO_2 samples were examined by using a HITACHI S-4800 field-emission scanning electron microscope (FE-SEM).

Preparation of TiO_2 nanobelts modified electrodes and electrochemical detection

A glassy carbon electrode (3 mm in diameter) was polished with 0.05 μm α-Al_2O_3

suspensions until a mirror surface was obtained, and rinsed extensively with anhydrous ethanol and deionized water. The electrode was then electrochemically cleaned in 0.5 M H_2SO_4 by cycling potentials between –0.3 and +1.8 V at 100 mV/s until a steady cyclic voltammogram was obtained. A conductive adhesive (CA) was dropcast onto the cleaned glassy carbon electrode (GCE) surface, onto which 3 μL of an ethanolic suspension of TiO_2 nanobelts (0.5 mg/mL) was added in a dropwise fashion. After drying, the resulting electrodes were denoted as TNs/CA/GCE or CTNs/CA/GCE.

Electrochemical measurements were performed in a three-electrode configuration. The TiO_2 nanobelts modified electrodes prepared above were used as the working electrode. A Pt foil acted as the auxiliary electrode. All potentials were referred to an Ag/AgCl/KCl saturated reference electrode. All analyte solutions were prepared in 0.1 M PBS (pH 7.4). Voltammetric data were acquired with a CHI 660C electrochemical workstation.