Supplementary Information

Potential-induced Reversible Switch in Tubular Structure of Conducting Polypyrrole Nanotube Arrays

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Experimental details

Fabrication of CPNAs The small electrochemical cell included biomedical titanium sheet (thickness of 0.2 mm, effective area of 15 mm×15 mm, ASTM F-67-2000) as working electrode, copper sheet as counter electrode, saturated calomel electrode (SCE) as reference electrode, a 0.2 M KCl solution as electrolyte containing 0.1 M Py. A prenucleation film (PNF) was obtained at 0.8 V (vs SCE) for 20 s at room temperature under the control of electrochemical station (Zennium Zahner, Germany), and dried in a vacuum atmosphere. Typically, in phosphate buffer solution (PBS, 0.5 M, pH 6.8) as electrolyte containing 0.2 M Py and 0.01 M β-naphthalenesulfonic acid (NSA), template-free electrochemical polymerization was used to galvanostatically (0.9 mA/cm^2) fabricate CPNAs on prenucleation film/biomedical titanium (as working electrode). The as-obtained products were rinsed for several times in deionized water, and dried under vacuum.

Switchable property for tubular structure To ascertain the redox potentials of CPNAs and PNF, cyclic voltammetry (CV) was utilized in a electrochemical system including PBS (pH 6.8) as electrolyte containing 0.01M NSA, PPy nanotube coating/tiantium sheet as working electrode, platinum electrode as counter electrode, and SCE as reference electrode. The CV curve was recorded by applying scanning voltage from -0.05 V to -1.00 V at a scan rate of 10mV/s. The switchable property for tubular structure of CPNAs was analyzed in the aforementioned electrochemical system. At first, a closed tubular structure (closed state) was formed by applying -0.80 V for 10 min (switch-close potential) to as obtained CPNAs, and open tubular structure (open state) by -0.15 V for another 10 min (switch-open potential) to CPNAs of closed state. The reversible open/closed (switchable) states of tubular structure was performed in the switch between switch-open/close potentials, switch was underwent for required cycles.

Characterization Field emission scanning electron microscopy （FE-SEM, ZEISS Ultra 55, Germany）was employed to examine the morphology of CPNAs, and the image signal was received by E-T detector, if no additional description. Electron probe micro-analyzer (EPMA, Shimadzu) was utilized to compare the composition of CPNAs in various tubular states.

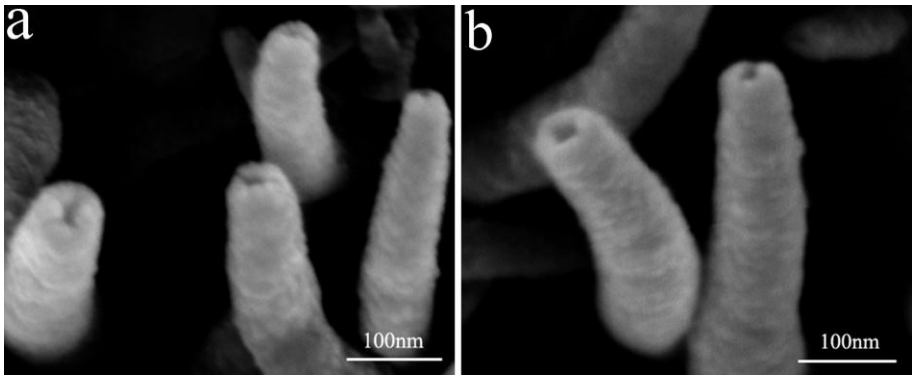

Figure. S1 FE-SEM images of CPNAs by (a) applying a potential of -0.65V less negative than -0.80 V, and (b) applying -0.25 V less positive than -0.15 V.

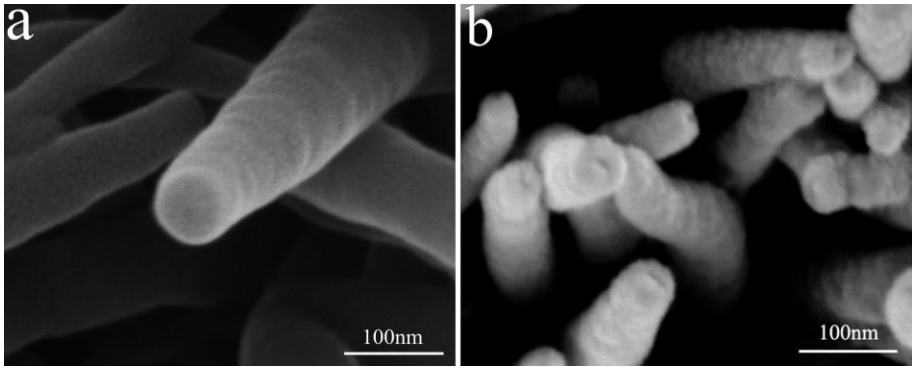

Figure. S2 FE-SEM images of CPNAs by (a) applying switch-open/close potentials with cycle of 1000 and follow by subsequent 0.05 V for 30 min, and (b) applying -0.80 V for 60 min and subsequent 0.05 V for 30min.