Electronic Supplementary Information

Improved power density of an enzymatic biofuel cell with fibrous porous supports of high curvature

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Fig S1. Specific surface area analysis of electrode materials. (a) CV trace of FeCOOH at gold/MWCNT fiber paddle electrode at 5 mV s⁻¹ scan rate. (b) Dependence of anodic (circle) and cathodic (square) peak currents on scan rate at high scan rates of FeCOOH at gold/MWCNT fiber paddle electrode. CV experiments performed in Ar saturated sodium phosphate buffer (0.1 M, pH 7.0). (c) Pore size distribution of graphene-coated SWCNT gel. (d) Cumulative pore volume with increasing pore size of graphene-coated SWCNT gel. Pore size information from DFT calculation scheme of BET surface area analysis.



Fig S2. Electrochemical performance of graphene-coated SWCNT gel anodic system at low scan rate. CV traces of copper clip, graphene-coated SWCNT gel anode, GOX-modified graphene-coated SWCNT gel anode and GOX-modified graphene-coated SWCNT gel anode in 0.1 M glucose. Experiments performed in Ar saturated sodium phosphate buffer (0.1 M, pH 7.0) at 5 mV s⁻¹ scan rate.



Fig S3. Electrochemical performance of anodic systems without enzyme loading. (a) CV traces of gold wire with and without 100 mM glucose, and gold/MWCNT fiber paddle anode with and without 100 mM glucose. (b) CV traces of copper clip with and without 100 mM glucose, and graphene-coated SWCNT gel anode with and without 0.1 M glucose. Experiments performed in Ar saturated sodium phosphate buffer (0.1 M, pH 7.0) at 50 mV s⁻¹ scan rate.



Fig S4. Amperometric performance of anodic systems. (a) Amperometry of GOX-modified gold/MWCNT fiber paddle anode in oxygen saturated solution with potential held at 0.8 V versus Ag/AgCl. (b) Amperometry of GOX-modified gold/MWCNT fiber paddle anode in Ar saturated solution with potential held at -0.43 V versus Ag/AgCl. (c) Amperometry of GOX-modified graphene-coated SWCNT gel anode in oxygen saturated solution with potential held at 0.8 V versus Ag/AgCl. (d) Amperometry of GOX-modified graphene-coated SWCNT gel anode in oxygen saturated solution with potential held at -0.42 V versus Ag/AgCl. (d) Amperometry of GOX-modified graphene-coated SWCNT gel anode in Ar saturated solution with potential held at -0.42 V versus Ag/AgCl. Glucose injections indicated by arrows with resulting concentration given in mM. Experiments performed in sodium phosphate buffer (0.1 M, pH 7.0).



Fig S5. Analysis of oxygen reduction by electrode materials. (a) CV traces of gold/MWCNT fiber paddle electrode in Ar saturated solution and in oxygen saturated solution. (b) CV traces of GOX-modified gold/MWCNT fiber paddle anode in oxygen saturated solution with and without 0.1 M glucose. Experiments performed in sodium phosphate buffer (0.1 M, pH 7.0) at 50 mV s⁻¹ scan rate.



Fig S6. Electrochemical performance of cathodic systems without enzyme loading. (a) CV traces of gold wire in Ar saturated solution and in oxygen saturated solution, and gold/MWCNT fiber paddle anode in Ar saturated solution and in oxygen saturated solution. (b) CV traces of copper clip in Ar saturated solution and in oxygen saturated solution, and gold/mWCNT fiber paddle anode in Ar saturated solution and in oxygen saturated solution. (b) CV traces of copper clip in Ar saturated solution and in oxygen saturated solution. Experiments performed solution and in oxygen saturated solution. (c) M, pH 7.0, at 50 mV s⁻¹ scan rate.



Fig S7. Amperometric performance of cathodic systems. (a) Amperometry of BOD-modified gold/MWCNT fiber paddle cathode in Ar saturated solution with potential held at 0.2 V versus Ag/AgCl. (b) Amperometry of BOD-modified graphene-coated SWCNT gel cathode in Ar saturated solution with potential held at 0.2 V versus Ag/AgCl. Beginning of oxygen bubbling indicated by arrows. Experiments performed in sodium phosphate buffer (0.1 M, pH 7.0)



Fig S8. EBFC performance without enzyme loading. (a) EBFC performance and cell polarization curves using gold wire alone. (b) Gold/MWCNT fiber paddlebased EBFC performance and cell polarization curves using bare anode and cathode with no adsorbed enzyme. (c) EBFC performance and cell polarization curves using copper clips alone. (d) Graphene-coated SWCNT gel-based EBFC performance and cell polarization curves using bare anode and cathode with no adsorbed enzyme. Experiments performed in air saturated sodium phosphate buffer (0.1 M, pH 7.0) with 0.1 M glucose. Error bars represent standard deviation of three trials.