Supporting Information for:

Exoelectrogenic biofilm as a template for sustainable formation of a catalytic mesoporous structure

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Supporting Figures

Figure SI1. Current density of individual electrodes during RDE tests at 2000 rpm sparged with (A) hydrogen and (B) nitrogen; 1000 rpm sparged with (C) hydrogen and (D) nitrogen; and 0 rpm sparged with (D) hydrogen and (E) nitrogen.
Figure SI2. Voltammograms of biotemplated electrodes that were pyrolyzed, but did not undergo the subsequent oxidation step generated with an RDE at 1000 rpm in 0.1 M H₂SO₄. Oxidation of the carbon within the structure is important and results in approximately double the current density (2.3 mA/cm²).
Figure SI3. (A) Current across a 1 kΩ resistor and (B) anode potential (vs. SHE) of electrodes operated in a hydrogen fuel cell without potentiostatic control to test electrical connectivity between the palladium layer and the graphite support. Reactors were alternately sparged with nitrogen and hydrogen to show the catalytic response of the reactors in the presence and absence of hydrogen. Electrons liberated during hydrogen oxidation were transferred through the circuit to the cathode showing that the palladium layer is electrically connected to the graphite support.
Figure SI4. Cyclic voltammograms of a biotemplated and electroplated electrode. The absence of pronounced reduction peak in the reverse scan suggests that the non-catalytic oxidative peak is due to corrosion and not a redox reaction. Curves were generated at 1mV/s scan rate and 1000 rpm in 0.1 M H₂SO₄.
Figure SI5. High magnification images of (A) electrochemically formed structure (20,000 ×) and (B) biotemplated mesoporous structure (55,000 ×). (C) TEM image of an ultra-microtomed (70 nm) *G. sulfurreducens* biofilm showing palladium reduction within the biofilm as a precursor for mesoporous structure formation. (D) Low magnification image of the mesoporous palladium layer on the graphite support post-processing.
Figure SI6. Energy dispersive x-ray spectroscopy (EDS) spectra of biotemplated Pd structure composed of 50% Pd and 50% C after pyrolysis alone at 450°C (-----) and composed of 97% Pd after pyrolysis at 450°C and oxidation at 450°C in air for 2 hours (——). The oxidation step is important to remove excess carbon formed from cell material during pyrolysis and expose more catalytically active Pd.
Figure SI7. BET nitrogen adsorption isotherms for the different samples.