

Figure S1. Fermentation processes for *Aizome* (Japanese indigo dyeing). The leaves of Japanese indigo plant are fermented oxidatively for 100 days. During fermentation, indican in Japanese indigo plant is converted into indigo. The fermented leaves are called *Sukumo*. Indigo in *Sukumo* is reduced into leuco-indigo, which is soluble under alkaline condition, by microorganisms.

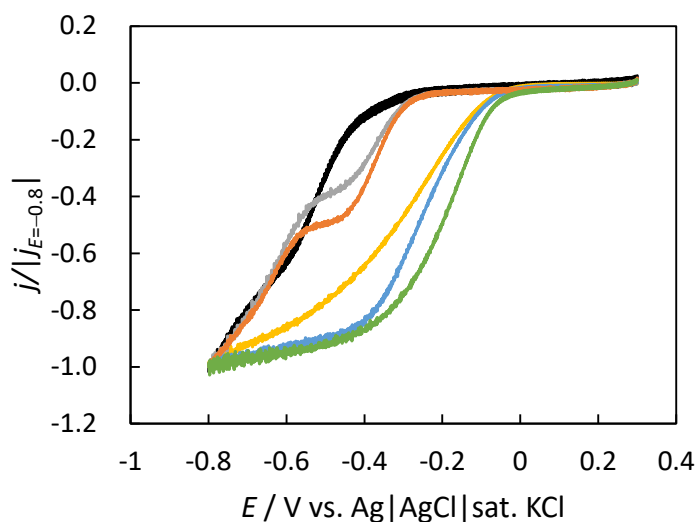


Figure S2. Normalized linear sweep voltammograms of the Pt and GC rotating disk electrodes. The scan rate was  $100 \text{ mV s}^{-1}$ , and the electrode rotating rate was 4000 rpm. The voltammograms were normalized by each absolute value of the current density at  $-0.8 \text{ V}$ . The measurements were performed in a  $20 \text{ mM NaHCO}_3\text{--Na}_2\text{CO}_3$  buffer at pH 10 (Pt: green line, GC: orange line) and in a  $20 \text{ mM Na}_2\text{HPO}_4\text{--NaOH}$  buffer at pH 11 (Pt: blue line, GC: gray line) and pH 12 (Pt: yellow line, GC: black line), at room temperature, under  $O_2$ -saturated conditions.

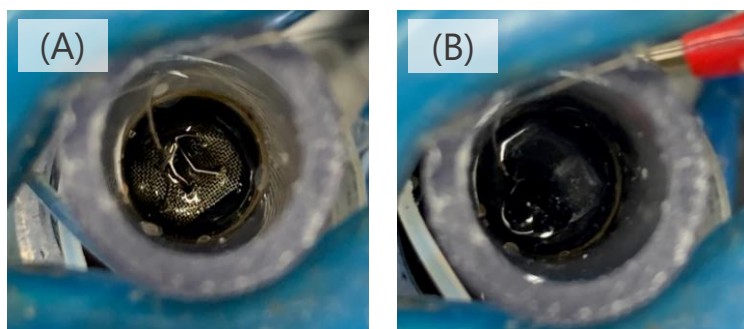


Figure S3. Top view of the Pt-mesh cathode.  
 (A) The Pt mesh was placed at the gas-liquid interface.  
 (B) The Pt mesh was immersed in the solution.

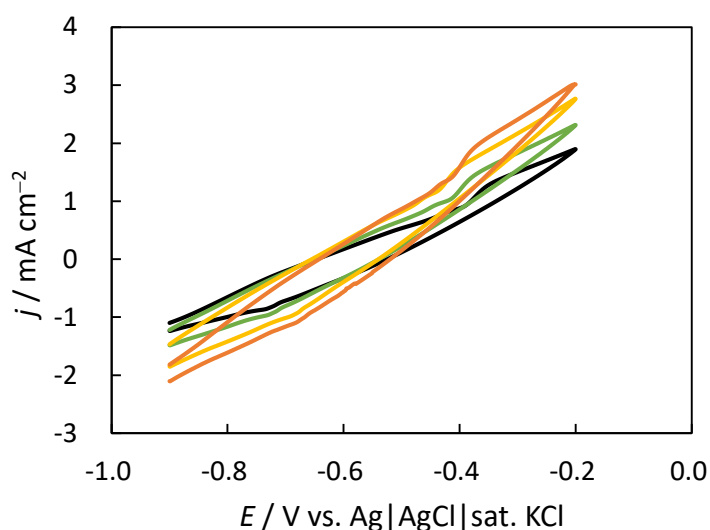


Figure S4. Cyclic voltammogram of the CFE in the indigo-dye fermenting suspension. The scan rate was  $20 \text{ mV s}^{-1}$ . The measurements were performed at room temperature (black line), 37 °C (green line), 48 °C (yellow line), and 58 °C (orange line) under quiescent and atmospheric conditions.

Video S1. LEDs powered by the indigo-dye fermenting suspension biofuel cell. The measurements were performed in the indigo-dye fermenting suspension at room temperature under quiescent and atmospheric conditions.