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Supplementary information

Pushing the limits for enzyme-based membrane-less hydrogen fuel cells running on H₂-air mixtures

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Figure S1. Dependence of stability of reciprocal of resistance of the LDR (%) with time (h = hours) for a red LED powered by the test bed (two 4x4 cells in series) using the compacted 60/40 G/MCNT electrodes under a 78% H₂-22% air atmosphere at 20°C. Other conditions: 0.1 M sodium phosphate buffer, pH 6.0.



Figure S2. Chronoamperograms of Hyd-2 at the compacted 100% MCNT having the thickness of 0.3 mm (black) and the thickness of 0.2 mm (blue) recorded at +0.006 V *vs.* SHE. The H₂-air mixtures with different ratios are periodically (every 1200 s) applied, as indicated in red (100% H₂ \rightarrow 89% H₂-11% air \rightarrow 100% H₂ \rightarrow 78% H₂-22% air \rightarrow 100% H₂). Other conditions: 0.1 M sodium phosphate buffer at pH 6.0 and 20°C.



Figure S3. Effect of enzyme concentrations on current densities after allowing permeation for 1 h in a cold room at 4 °C. (i) Measurements recorded at +0.206 V vs. SHE for Hyd-1-modified compacted 60/40 G/MCNT electrode in 100% H₂. (ii) Measurements recorded at +0.306 V vs. SHE for BOD-modified compacted 60/40 G/MCNT electrode in 100% air. Other conditions: 0.1 M sodium phosphate buffer, pH 6.0, 20 °C.