Supplementary information for:


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Figure S1 (A) Rotation rate dependence (in rpm) of the electrocatalytic current density for H₂ oxidation at a [PGE/MWNT/Py-Hyd1] electrode or Hyd1 simply adsorbed on polished PGE ([PGE/Hyd1]). Experimental conditions: 100 % H₂, 25 °C, pH 6.0, potential -40 mV vs SHE. (B) Koutecky-Levich plot analyzing the H₂ oxidation current density by the [PGE/MWNT/Py-Hyd1] electrode, measured at -40 mV vs SHE.
Figure S2 (A) Rotation rate dependence (in rpm) of the electrocatalytic current density for O₂ reduction at a [PGE/MWNT/Py-BOD] electrode or BOD simply adsorbed on polished PGE ([PGE/BOD]). Experimental conditions: saturated O₂, 25 °C, pH 5.0, potential +340 mV vs SHE. (B) Koutecky-Levich plot analyzing the O₂ reduction current density by the [PGE/MWNT/Py-BOD] electrode, measured at +340 mV vs SHE.

Figure S3 Stability measurements in saturated O₂ for (a) a [PGE/MWNT/Py-BOD] electrode and (b) BOD adsorbed on polished PGE ([PGE/BOD]). Chronoamperometry was carried out at +340 mV vs SHE, 25 °C, pH 5.0, 2500 rpm. (Inset) Enlarged chronoamperometry trace of (b).
Figure S4 (A) Voltammograms of a [PGE/MWNT/Py-Hyd1] anode and a [PGE/MWNT/Py-BOD] cathode after 24 h operation in the membraneless quiescent fuel cell, operated at an applied potential of 0.98 V in an 80:20 H₂/air fuel mixture, pH 5.0, 25°C; (B) Current density vs time for the [PGE/MWNT/Py-BOD] cathode in the fuel cell at an applied constant potential of 0.98 V in an 80:20 H₂/air fuel mixture, pH 5.0, 25°C.

Figure S5 Voltammograms of a [PGE/MWNT/Py-Hyd1] anode and a [PGE/MWNT/Py-BOD] cathode at various separation distances (as denoted in the graph in mm) in the quiescent membraneless fuel cell through which an 80:20 H₂/air fuel mixture was bubbled. Other conditions: 25 °C, pH 5.0.