

## Surface Adsorption Affects the Performance of Alkaline Anion-Exchange Membrane Fuel Cells

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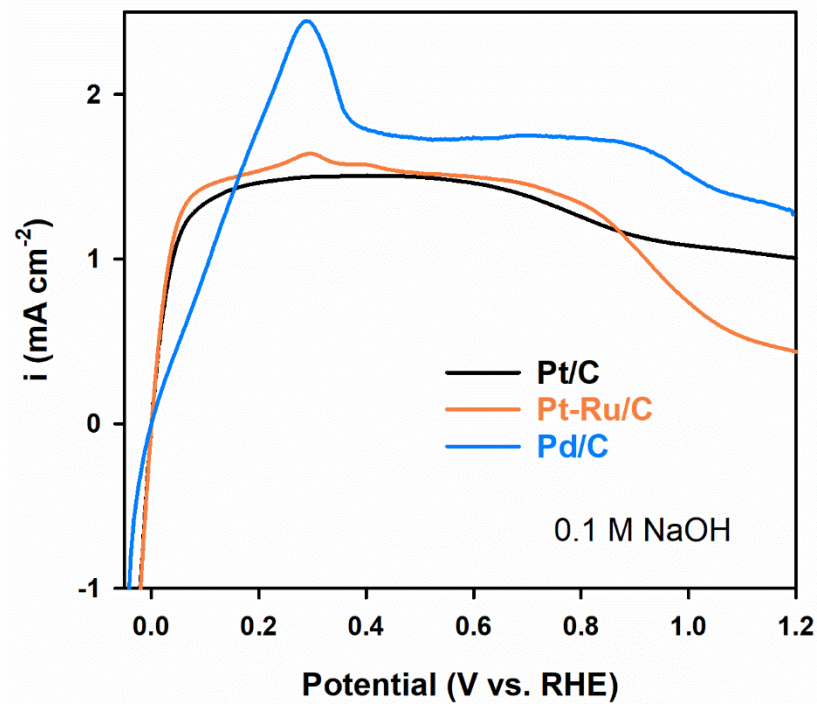
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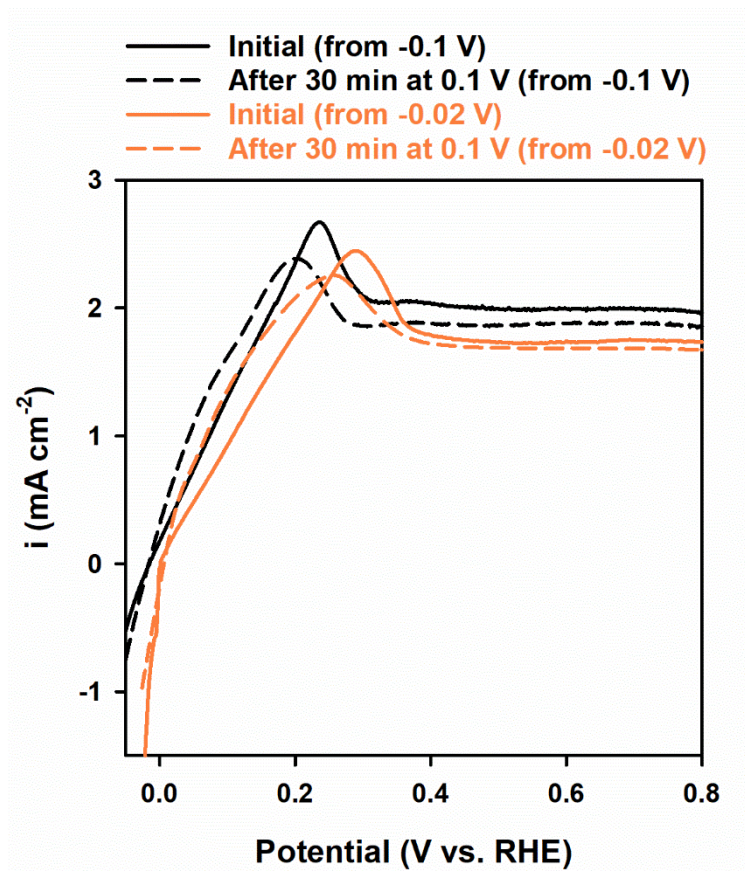
### Content

Figure S1-S4.

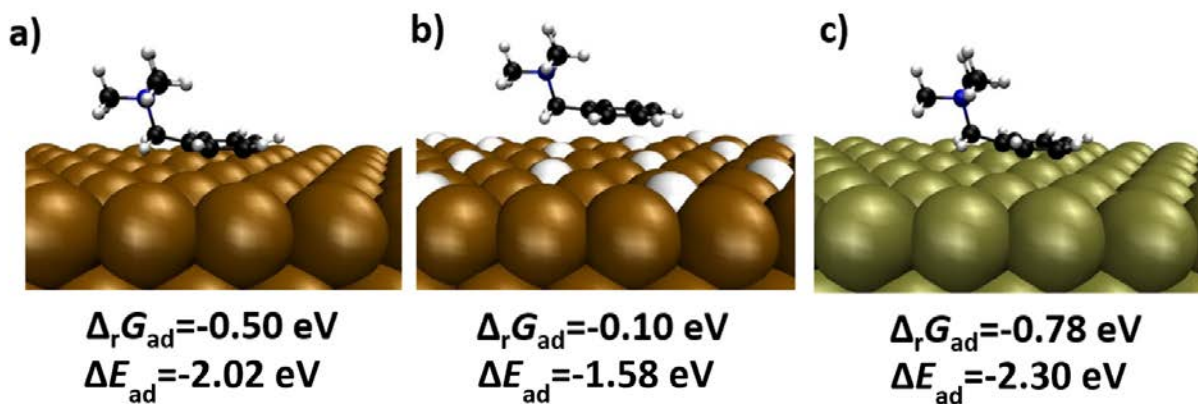
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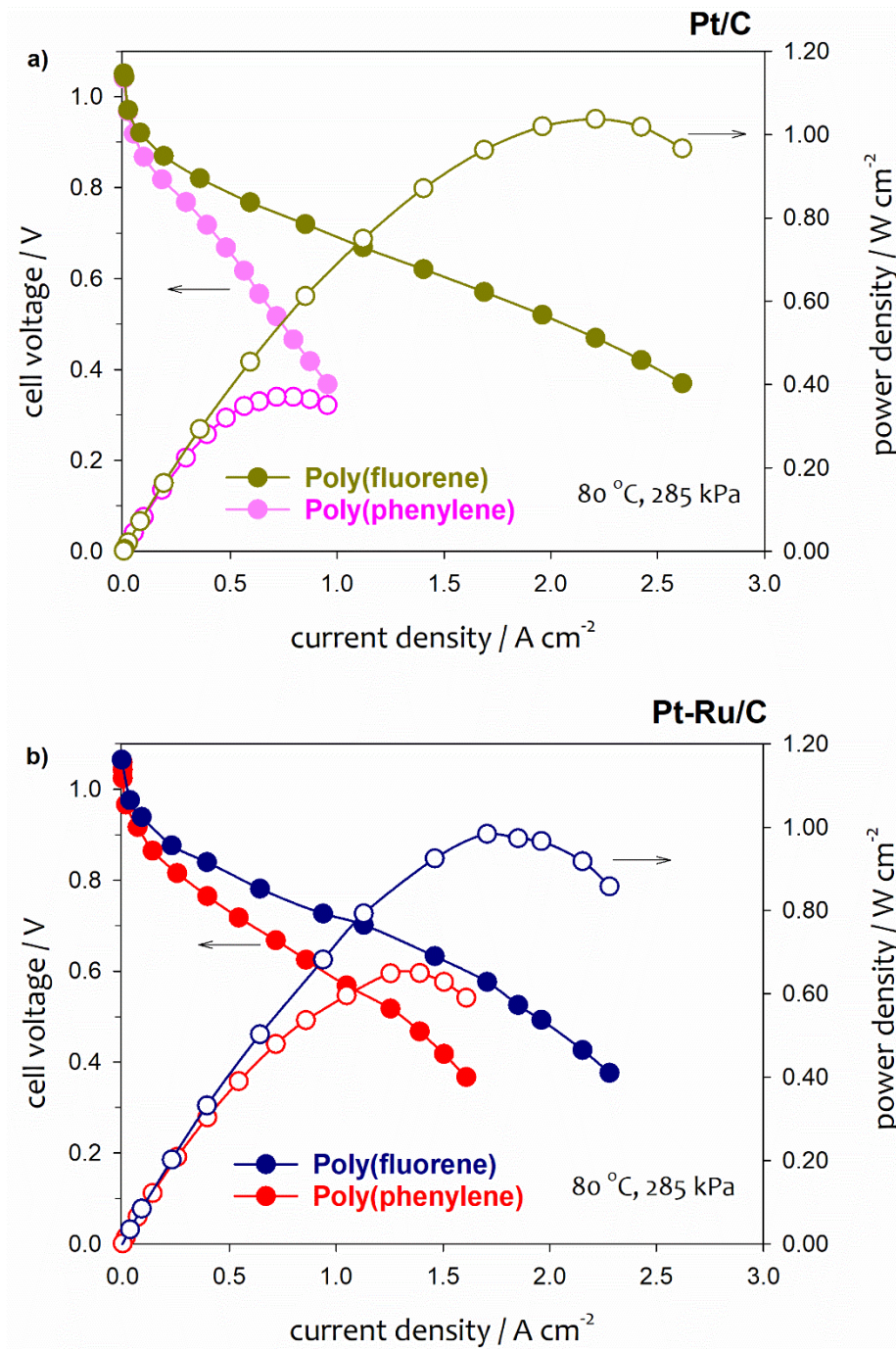
**Figure S1.** RDE experiment in 0.1 M NaOH (a) HOR voltammograms of Pt/C, Pt-Ru/C and Pd/C. The metal loading was  $20 \text{ mg cm}^{-2}$ . The HOR voltammograms were performed at  $25 \text{ }^\circ\text{C}$ ; rotating speed, 900 rpm; and scan rate,  $5 \text{ mV s}^{-1}$ .



**Figure S2.** Impact of scanning window of the HOR voltammograms of Pd/C in 0.1 M NaOH; Black lines: scanning from  $-0.1$  V vs. RHE, orange lines: scanning from  $-0.02$  V vs. RHE. Solid line: initial voltammogram after preconditioning at  $1.4$  V vs. RHE for 30 sec. Short dash line: after exposure the electrode at  $0.1$  V vs. RHE for 30 min. The HOR voltammograms were performed at  $25$  °C; rotating speed,  $900$  rpm; and scan rate,  $5$  mV s $^{-1}$ .



**Figure S3.** DFT calculated geometries, free energy and adsorption energy for the phenyl group on a) Pd, b) Pd with 0.33 ML coverage of H and c) Pt.



**Figure S4.** Impact of ionomer on Pt/C (a) and Pt-Ru/C (b) anode catalyzed AEMFC performance<sup>1</sup>. Measured at 80 °C under H<sub>2</sub>/O<sub>2</sub> with fully humidified H<sub>2</sub> (500 sccm) and O<sub>2</sub> (300 sccm) at 285 kPa backpressure. Cathode: Pt/C (0.6 mg<sub>Pt</sub> cm<sup>-2</sup>), Anode: Pt/C (0.6 mg<sub>Pt</sub> cm<sup>-2</sup>) or Pt-Ru/C (0.5 mg<sub>Pt</sub> cm<sup>-2</sup>).

**Reference:**

1. Kim, Y. S. Advanced Materials for Fully-Integrated MEAs in AEMFCs, in 2018 U.S. DOE Hydrogen and Fuel Cells Program and Vehicle Technologies Office Annual Merit Review and Peer Evaluation Meeting, June 13-15, 2018. [https://www.hydrogen.energy.gov/pdfs/review18/fc146\\_kim\\_2018\\_o.pdf](https://www.hydrogen.energy.gov/pdfs/review18/fc146_kim_2018_o.pdf), accessed on August 30, 2018.