

Supplementary Information

Energy harvesting from humidity changes with a flexible coaxial electrode solid-state cell

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Figure S1. Photograph of fiber cell connected to potentiostat. Cell dimensions: 7 cm long, inner electrode diameter of ~200 micron, maximum outer diameter of 1 mm.

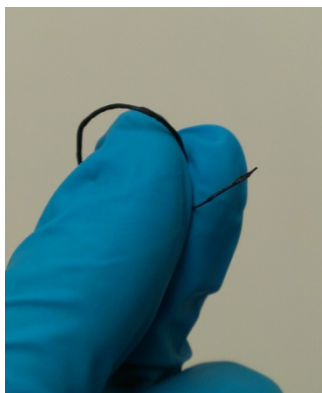


Figure S2. Photograph showing the flexibility of the fiber cell.

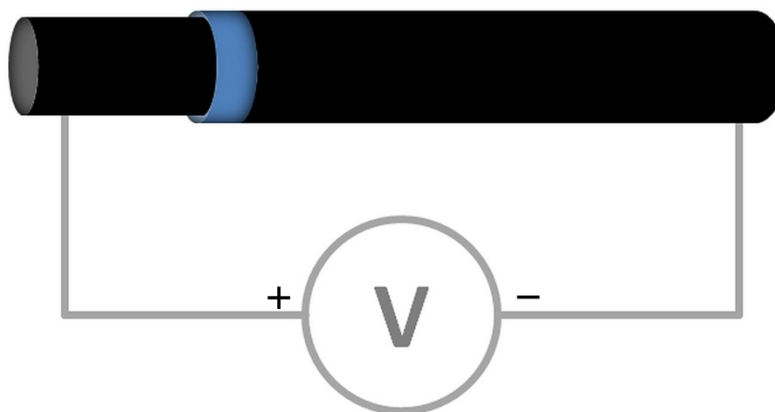


Figure S3. Schematic of the coaxial fiber cell and location of the measurement circuit contacts.

Raw data from cycling tests:

Note: Only two of the three cycles are shown in order to provide a higher resolution view of the data.

35%-45%:

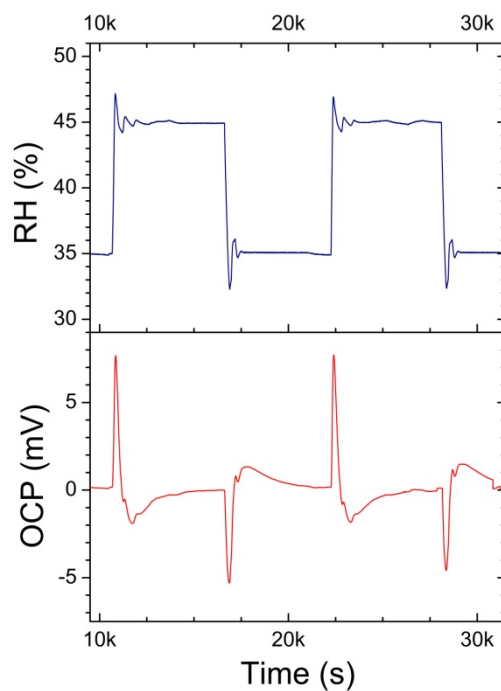


Figure S4. Comparison of the OCP response and the commercial humidity sensor when cycling the relative humidity between 35% and 45%.

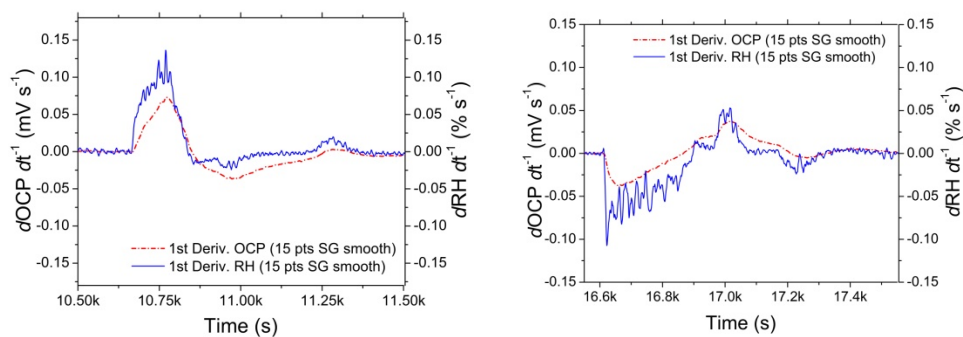


Figure S5. First derivatives of the RH and OCP data for one increase and one decrease in RH from the 35% - 45% RH tests.

45%-55%:

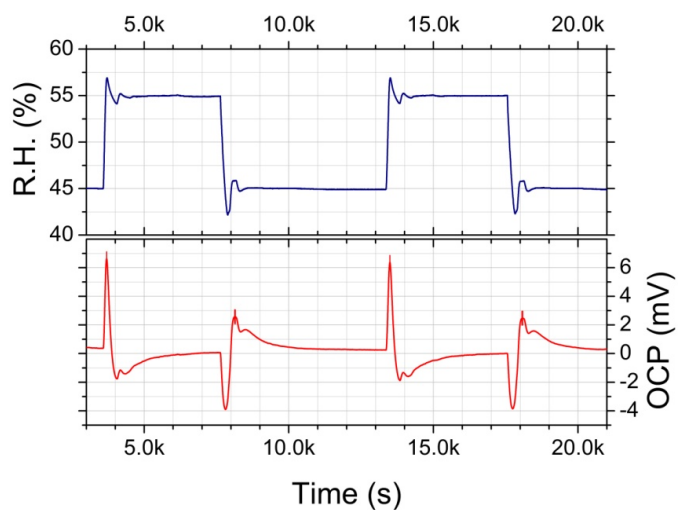


Figure S6. Comparison of the OCP response and the commercial humidity sensor when cycling the relative humidity between 45% and 55%.

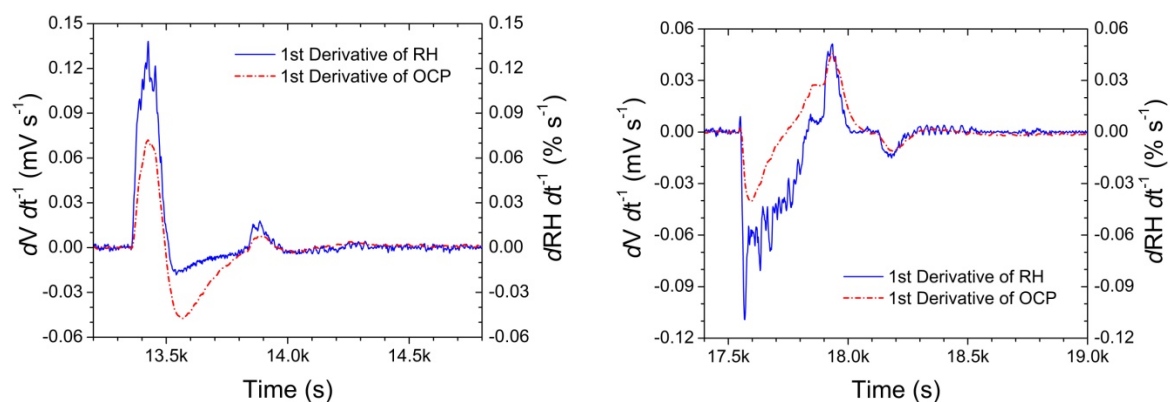


Figure S7. First derivatives of the RH and OCP data for one increase and one decrease in RH from the 45% - 55% RH tests.

55%-65%:

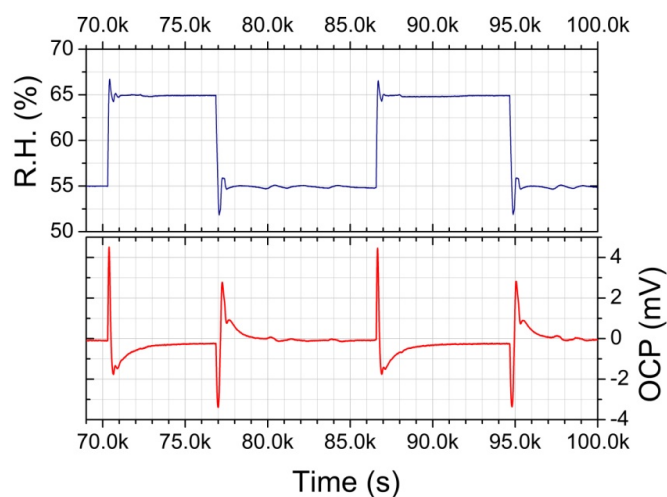


Figure S8. Comparison of the OCP response and the commercial humidity sensor when cycling the relative humidity between 55% and 65%.

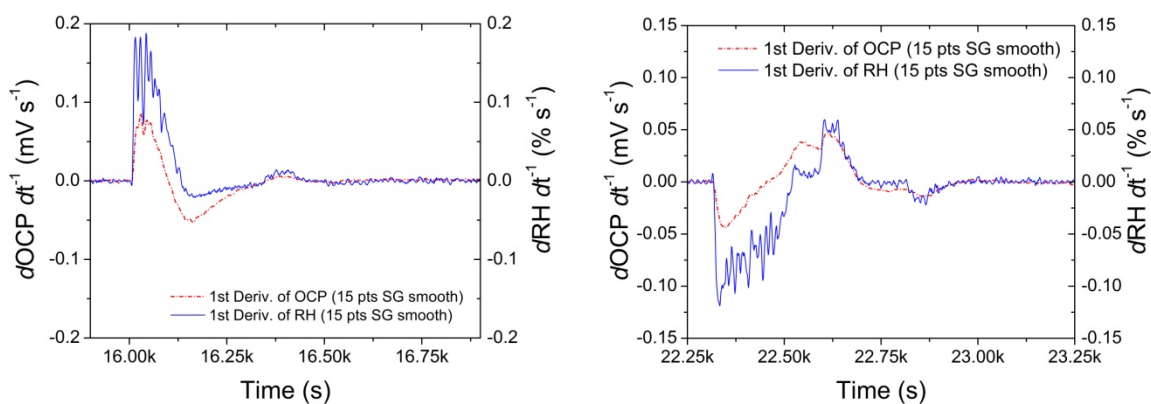


Figure S9. First derivatives of the RH and OCP data for one increase and one decrease in RH from the 55% - 65% RH tests.

45% \pm 0.25%:

Two examples of the low-magnitude RH oscillation periods:

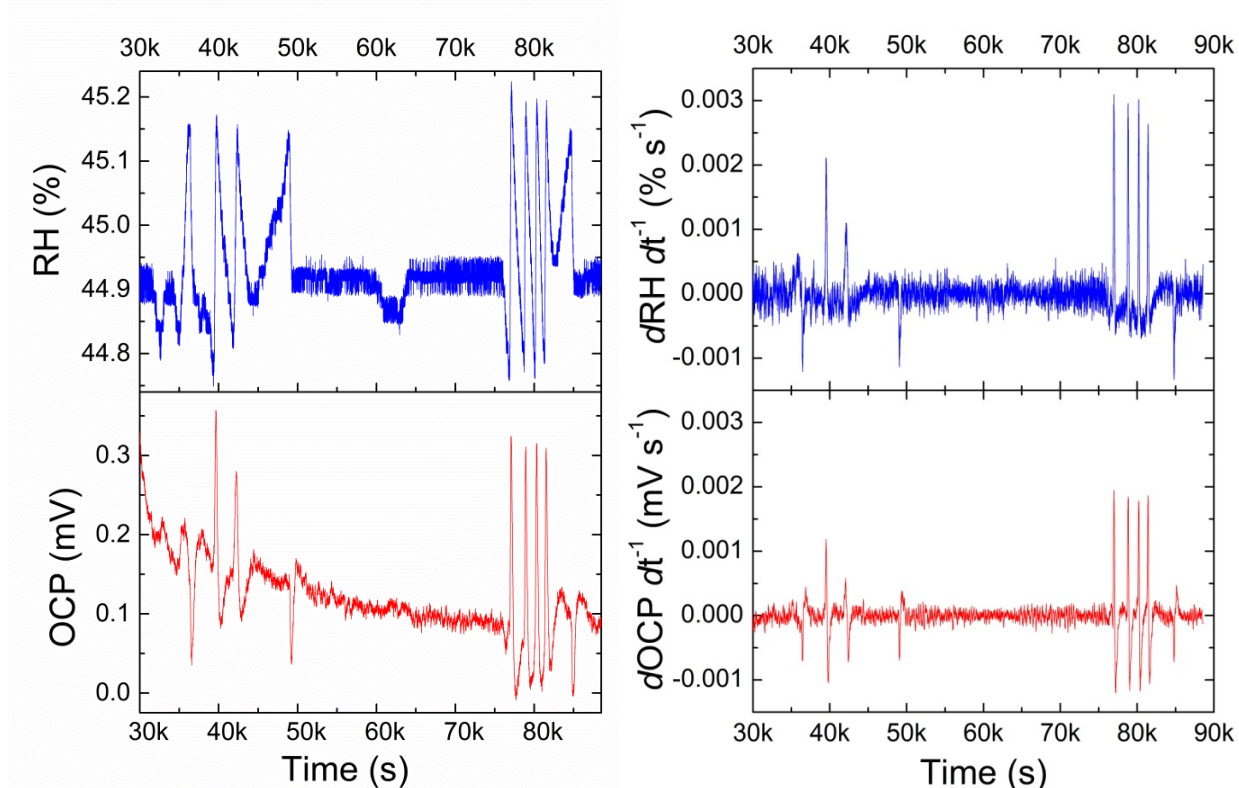


Figure S10. Showing two low-magnitude RH oscillation periods and the first derivatives: The first period is from ~ 30k to 50k and the second period from 75k to 90k was shown/discussed in paper.

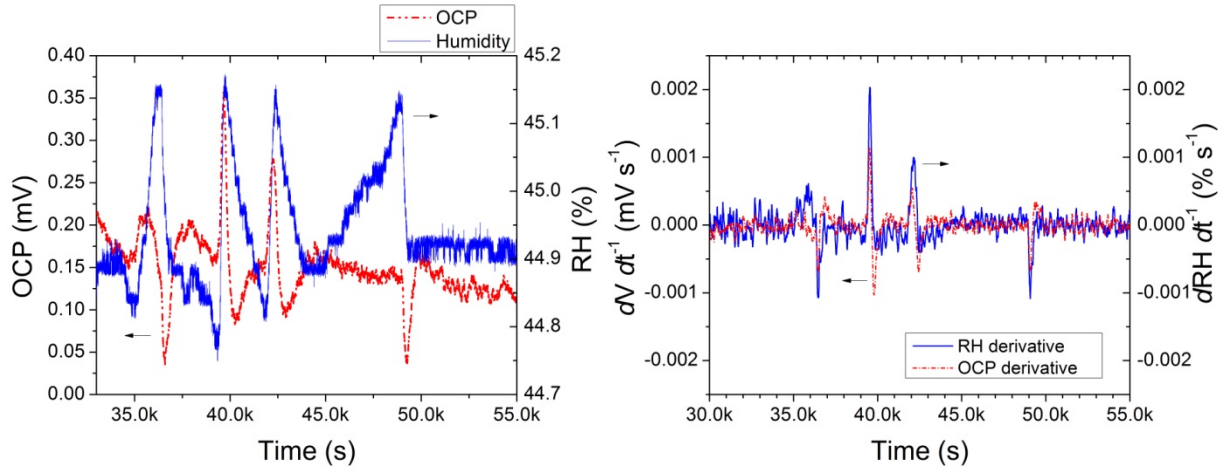


Figure S11. Magnification on the period from 30k to 50k also shows evidence of the rate dependency (no OCP change on slow RH increase but OCP change on fast RH decrease).

Modeling the response based on the Nernst relationship:

Modeling OCP at time i , based on humidity at time i , and the initial humidity ($humidity_0$).
(Model only applicable while the activity of water at the inner electrode remains unchanged i.e. equal to $humidity_0$.)

$$\Delta OCP_i^{Nernst} = \frac{RT}{zF} \ln \frac{humidity_i}{humidity_0} \quad (S1)$$

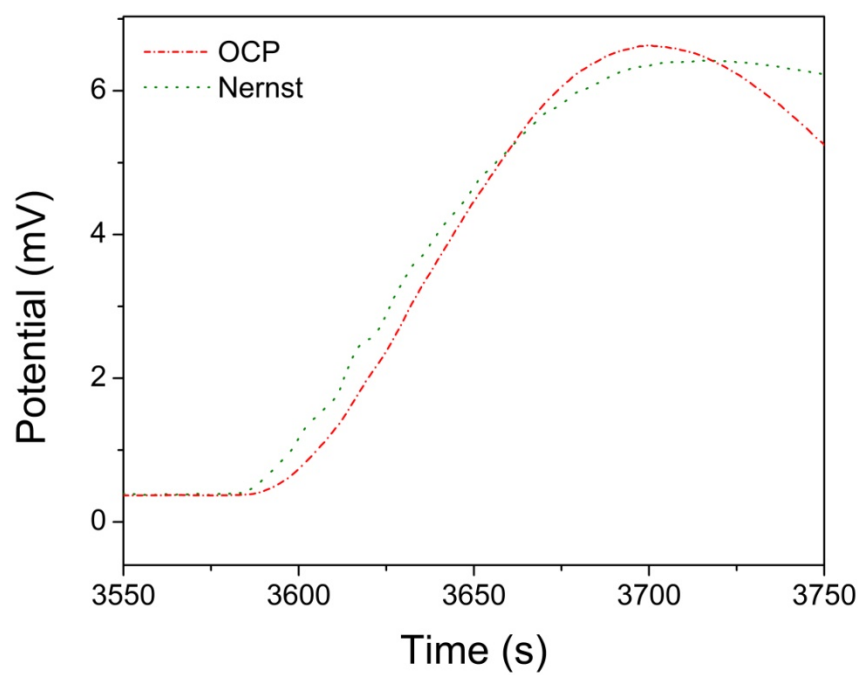


Figure S12. Increase from 45% to 55% RH.

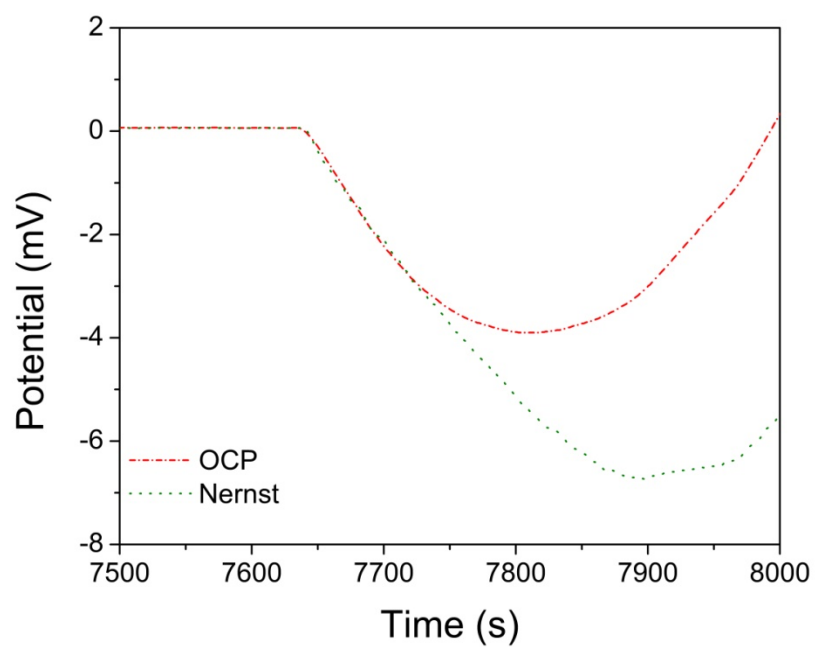


Figure S13. Decrease from 55% to 45% RH.