Electronic Supplementary Material (ESI) for RSC Advances.


**Supporting Data**

# Effects of Proton Conduction on Dielectric Properties of Peptides

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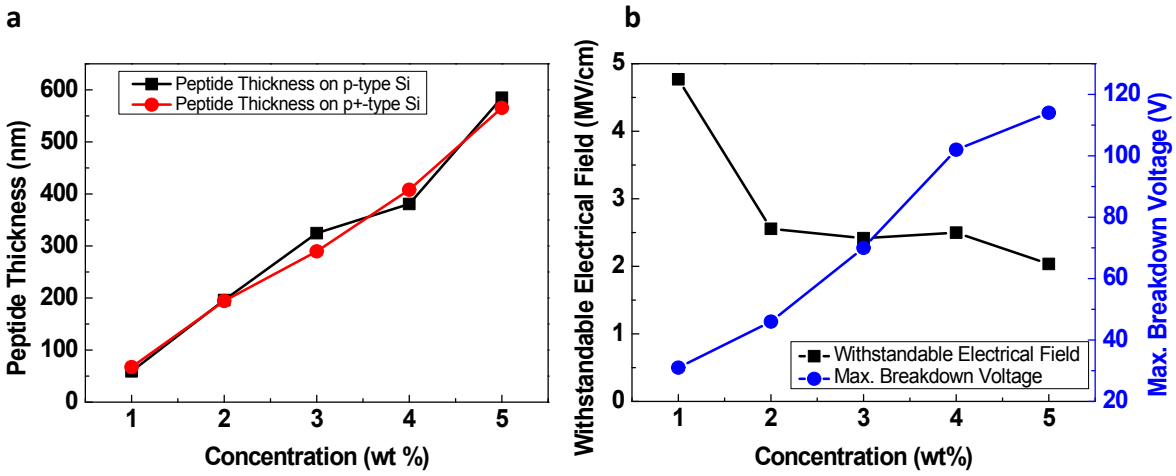



Fig. S1 (a) Thickness of the spin-coated peptide insulator with different concentration of the peptide solution. (b) Maximum breakdown voltage and thickness-normalized withstandable electrical field of the peptide insulator with different thickness. Thickness increases as the concentration increases and the maximum breakdown voltage increases as the thickness increases.

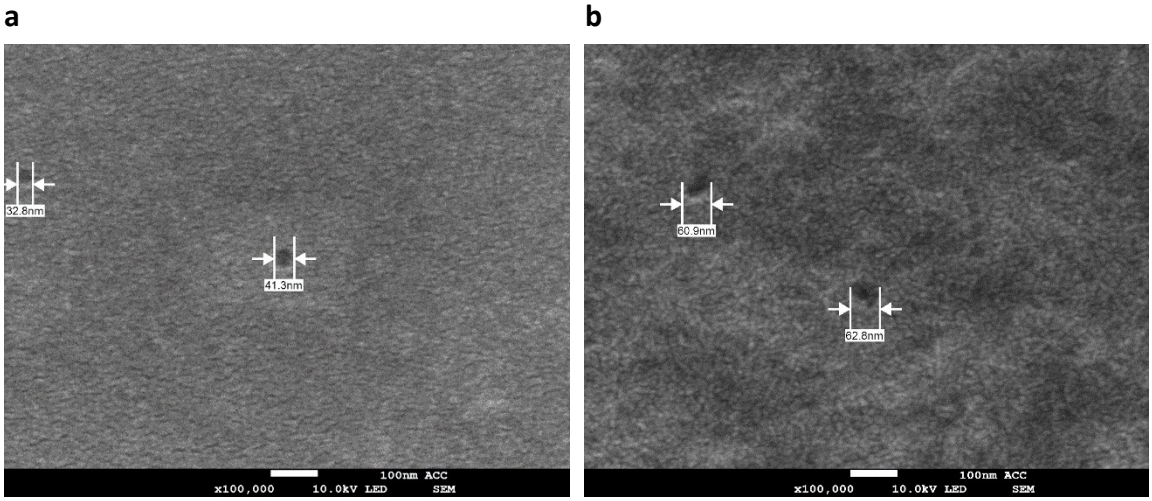



Fig. S2 SEM image of the surface of the annealed peptide with (a) 1 wt % concentration and (b) 5 wt % concentration of solution. Pin-holes that induce early breakdown of the peptide insulator are visible.

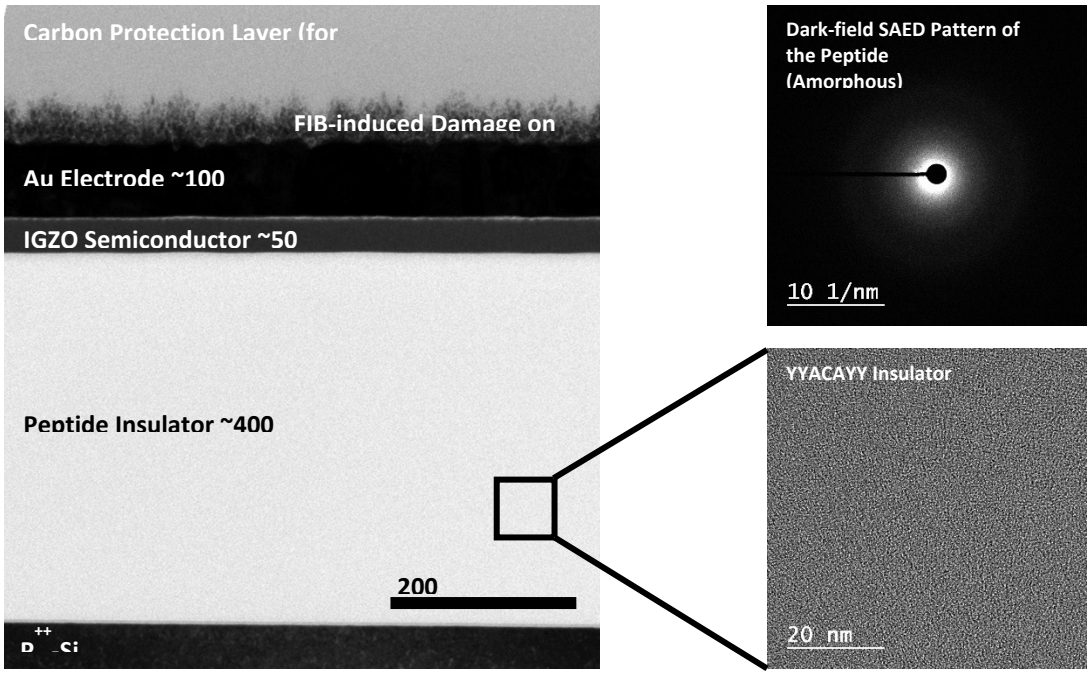



Fig. S3 TEM Images of the fabricated TFT and the peptide insulator. As the SAED pattern shows, the spin-coated peptide is amorphous.

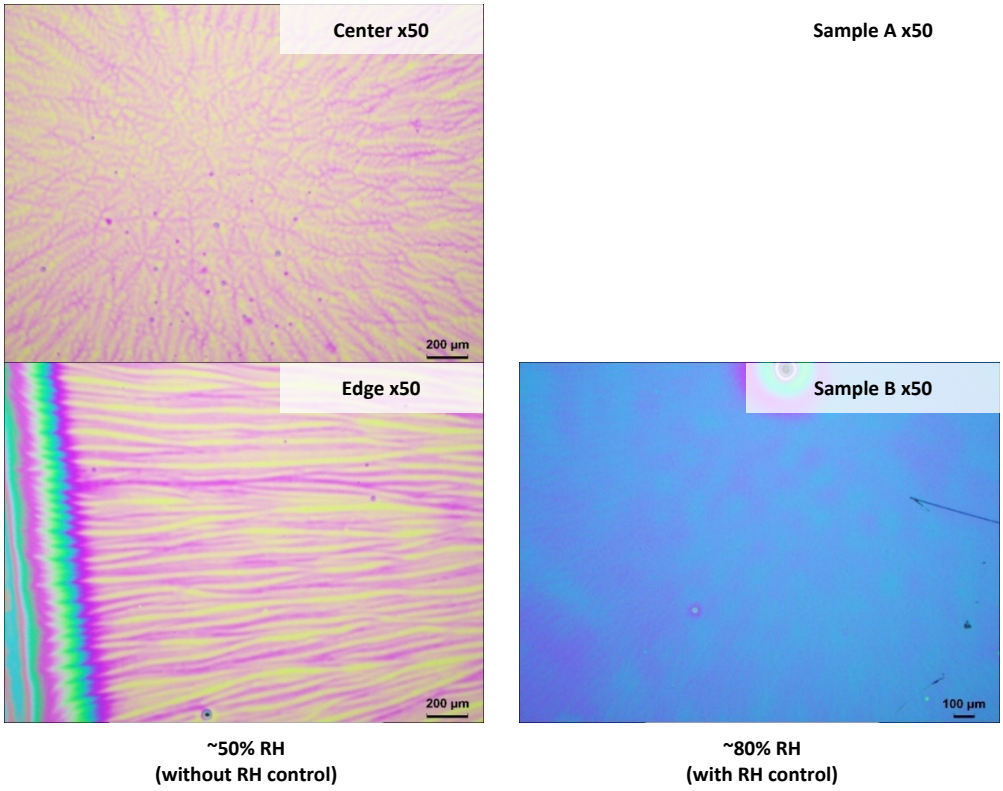
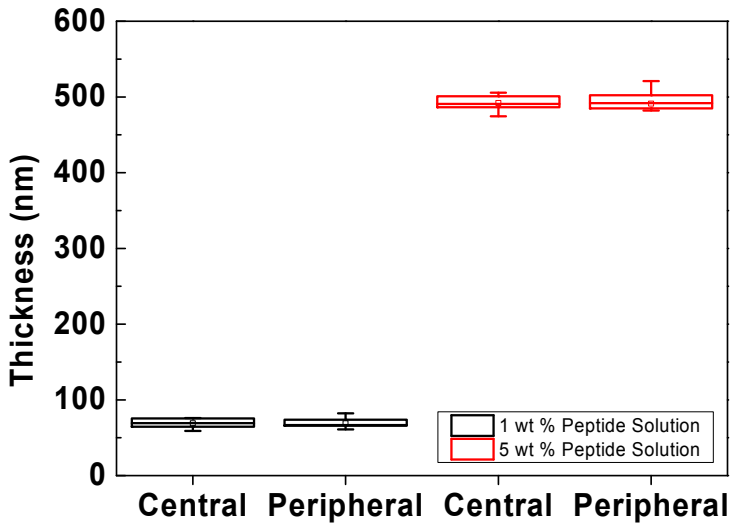



Fig. S4 Optical microscopic image of the surface of the spin-coated peptide. According to the RH condition at the time of spin-coating, striation pattern on the peptide is changed.

a




**b Average Percentage Error against the Average Thickness**

| | 1 wt% | 5 wt% |
|---|---|---|
| Central Points (8 samples) | 5.42 % | 1.41 % |
| Peripheral Points (12 samples) | 7.83 % | 2.50 % |

Fig. S5 (a) Sample-to-sample variation of the thickness of the spin-coated peptide. Central region and peripheral region are distinguished. (b) A table of average percentage error of the thickness of peptide samples showing that the peptide spin-coated with solution that has higher concentration has lower sample-to-sample variation.

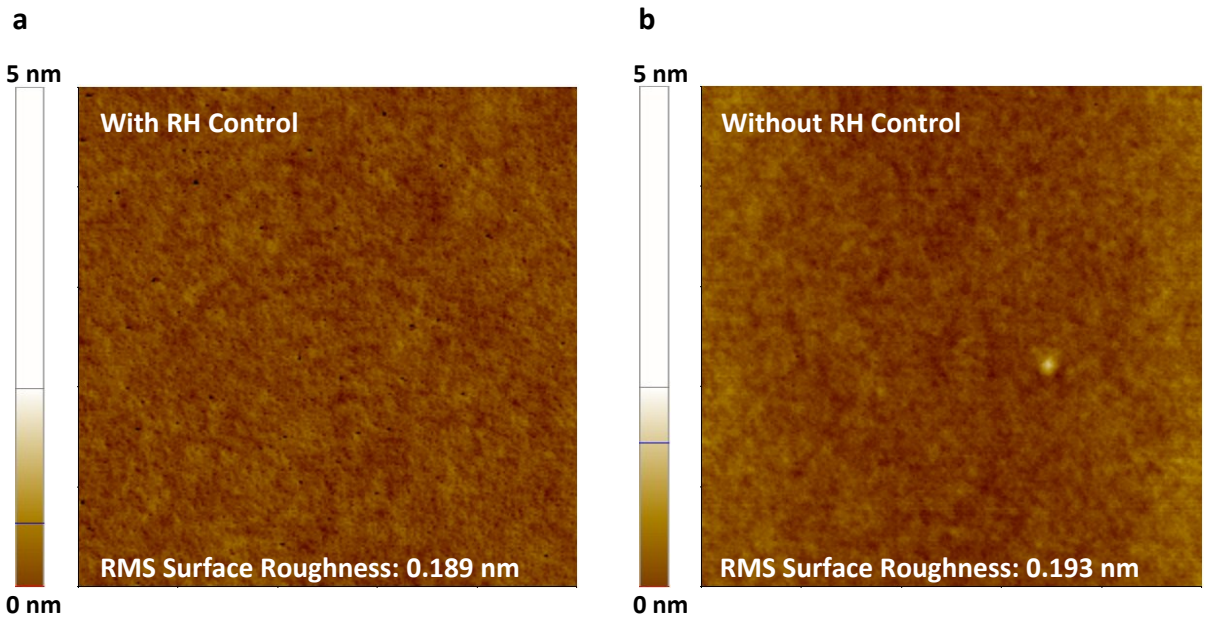



Fig. S6 5 µm x 5 µm AFM surface image of the 4 wt % peptide (a) with RH control and (b) without RH control at the time of spin-coating. With the RH control, RMS surface roughness of 0.189 nm was obtainable.

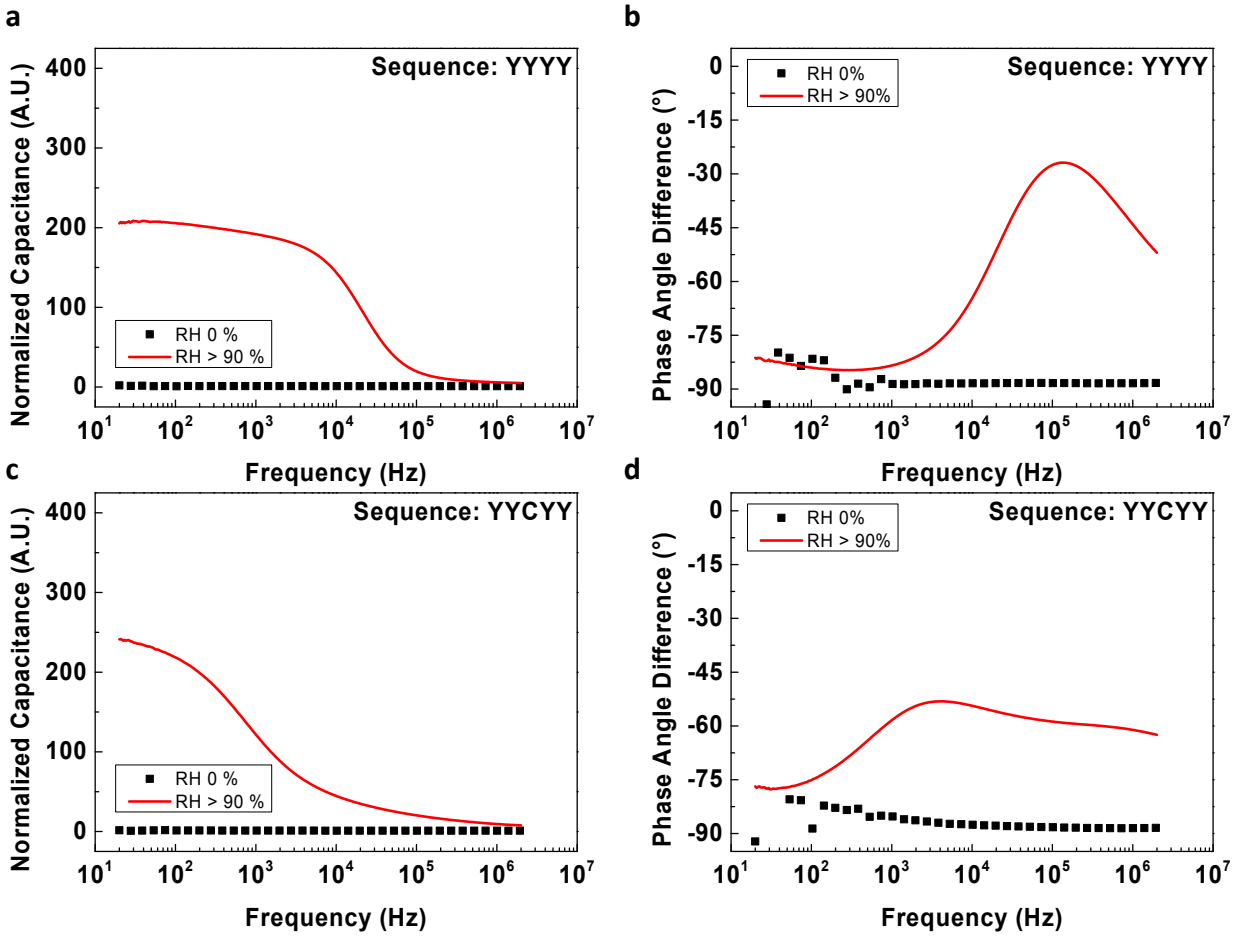



Fig. S7 Normalized capacitance of the peptide sequences YYYY (a) and YYCYY (c). The capacitance was normalized at 2 MHz under RH 0% condition for each sequence. Similar to YYACAYY, the capacitance increases as the humidity increases. Additionally, phase angle difference of YYYY (b) and YYCYY (d) also shows the similar behavior to YYACAYY.