

## Capitalization of interfacial AlON interactions to achieve stable binder-free porous silicon/carbon anodes

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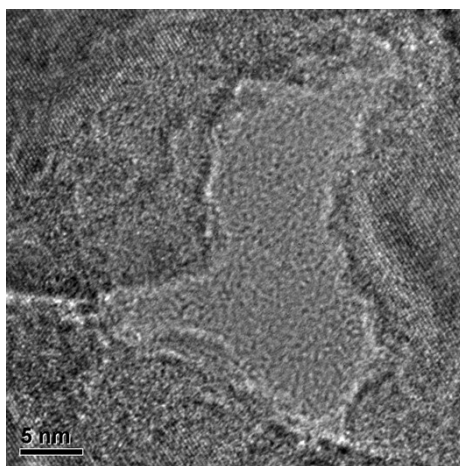


Figure S1. High resolution TEM image of PS.

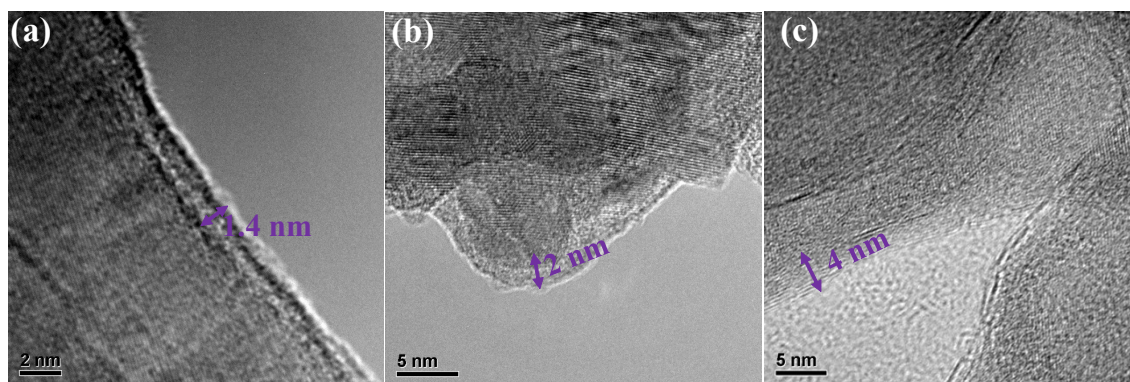


Figure 2. HRTEM images of PS/Al<sub>2</sub>O<sub>3</sub> with different thicknesses: 0.4 nm (a), 1 nm (b) and 3 nm (c).

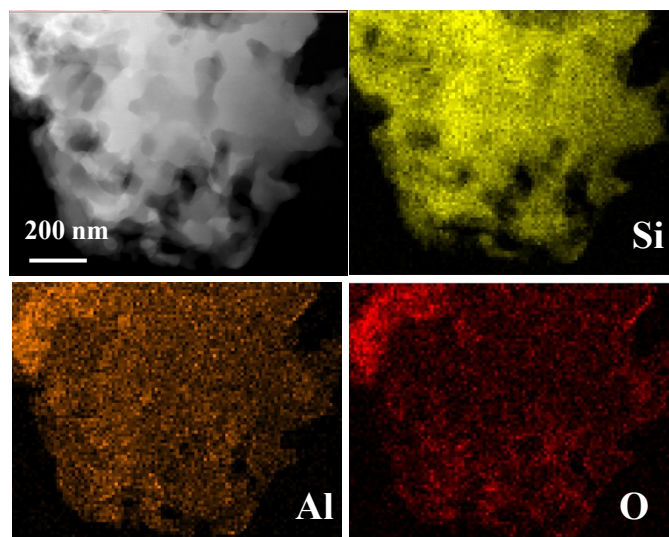


Figure S3. Dark field TEM image of PS/ $\text{Al}_2\text{O}_3$  and corresponding EDS elemental mapping.

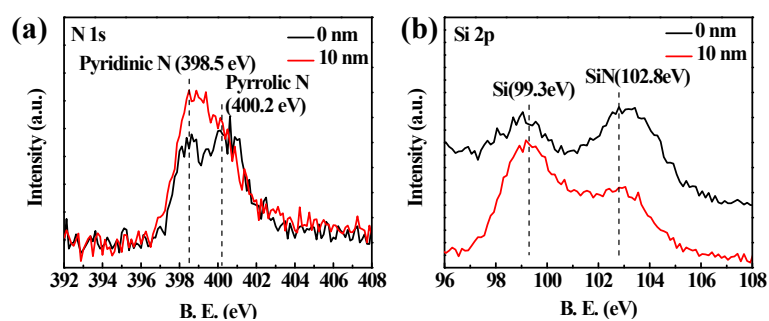


Figure S4. High resolution XPS depth analysis of PS /c-PAN: (a) N 1s, and (b) Si 2p. was maintained after 5 cycles.

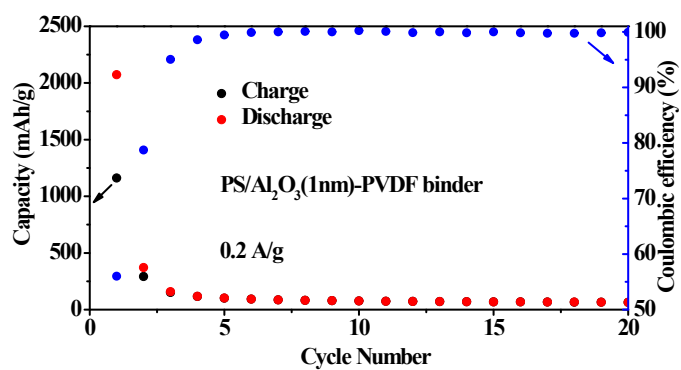


Figure S5. Cycle performance of PS/ $\text{Al}_2\text{O}_3$  (1 nm) with PVDF binder between voltage window of 0.005V-2.5V.

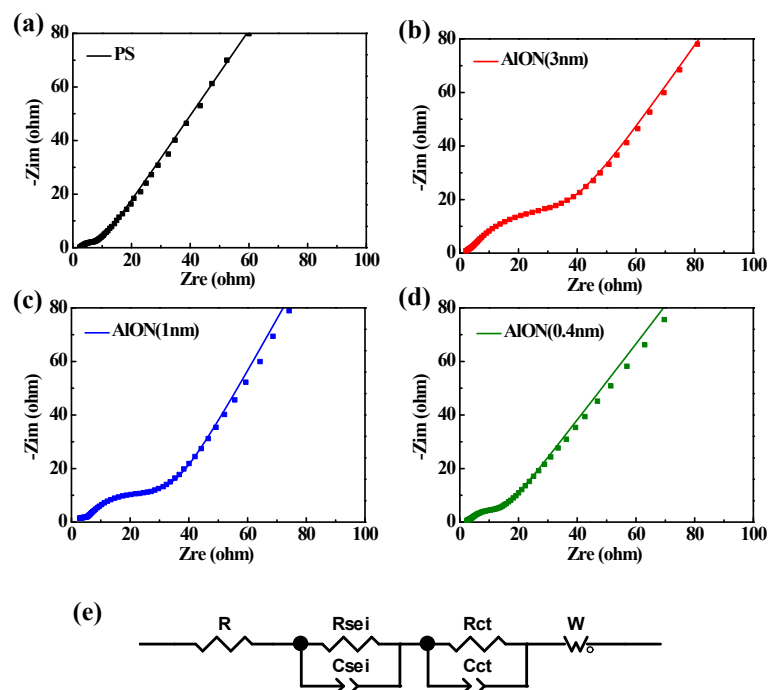


Figure S6. Fitting EIS curves of PS/AION(1nm)/c-PAN after 2 cycles.