

Supporting Information

Polymeric One-side Conductive Janus Separator with Preferably Oriented Pores for Enhancing Lithium Metal Battery Safety

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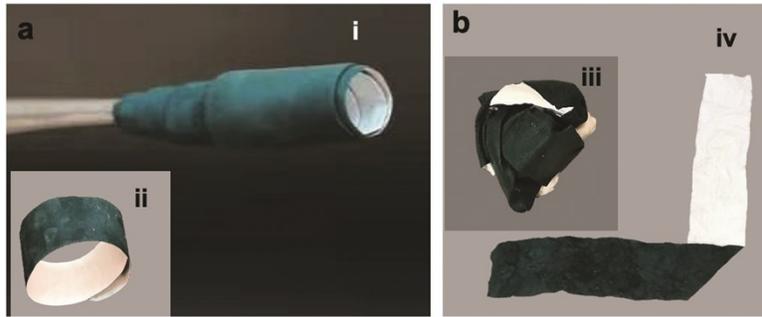


Figure S1. Digital photos of (a) rolled O-PVA-PANI tapes, showing their good flexibility and stiffness, (b) a piece of crumpled O-PVA-PANI ribbon, and the same ribbon after removing the crumples.

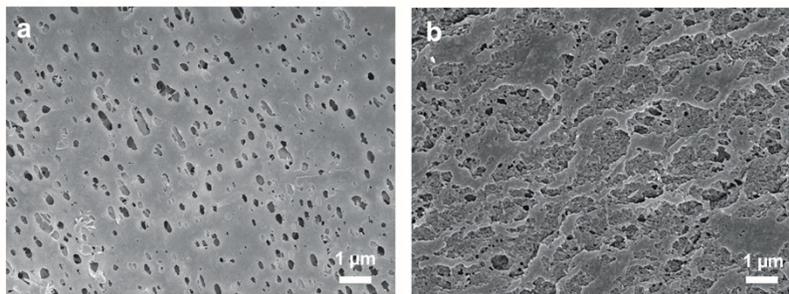


Figure S2. SEM images showing surface morphologies of (a) PVA side and (b) PANI side of the R-PVA-PANI separator.

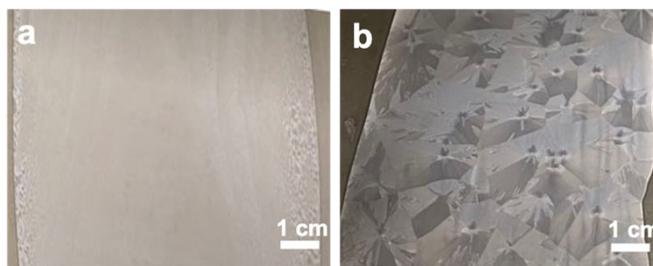


Figure S3. Optical images of the PVA gel layers frozen by (a) contacting with liquid nitrogen at the bottom of the layer (directional freezing) (b) placing it in a refrigerator.

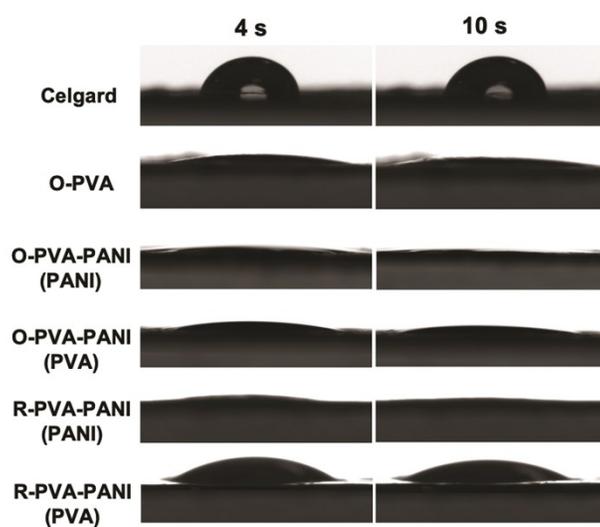


Figure S4. Contact Angle of electrolyte (1 M LiPF₆/EC: DMC 1:1 v/v) drop on Celgard separator, O-PVA separator O-PVA-PANI separator and R-PVA-PANI separator at 4s and 10s after dripping. The operation temperature is 25 °C.

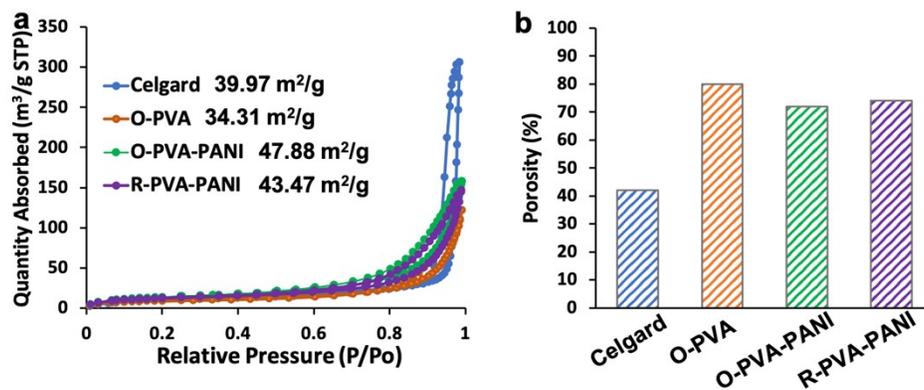


Figure S5. Brunauer–Emmett–Teller (BET) surface areas (a) and the porosities (b) of different separators.

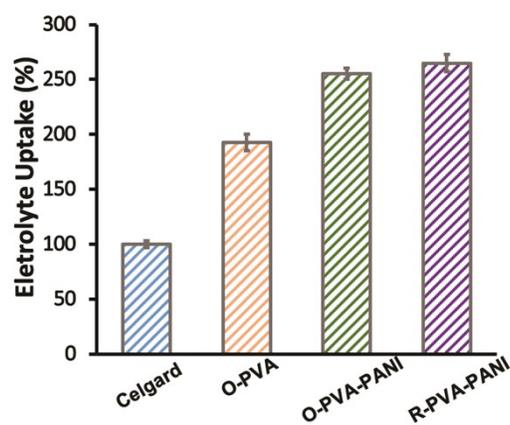


Figure S6. The electrolyte uptake (%) values of the separators.

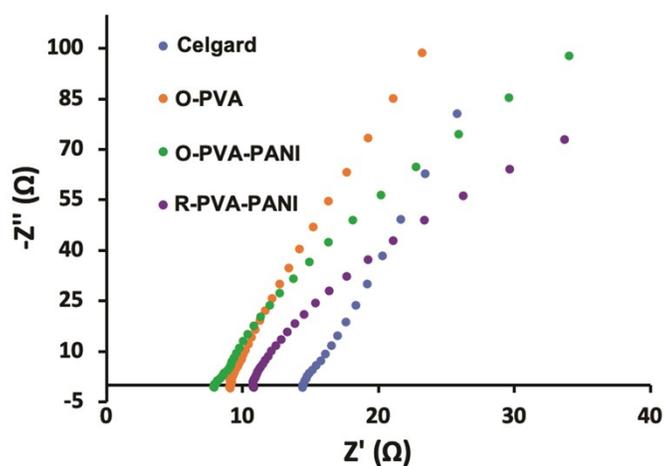


Figure S7. Nyquist plots of different separators by using a Steel|Separators|Steel system. The spectra were recorded over a frequency range from 0.01 Hz to 1 MHz.

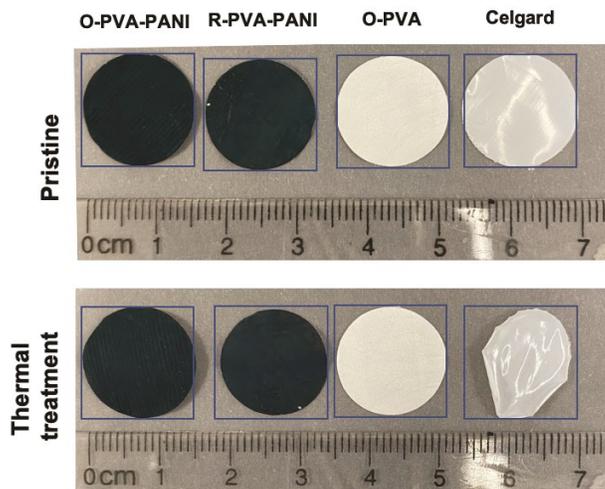


Figure S8. Thermal shrinkage of separators before and after thermal treatment in oven at a 160 °C for 1 h. The side length of the square frame is 16 mm.

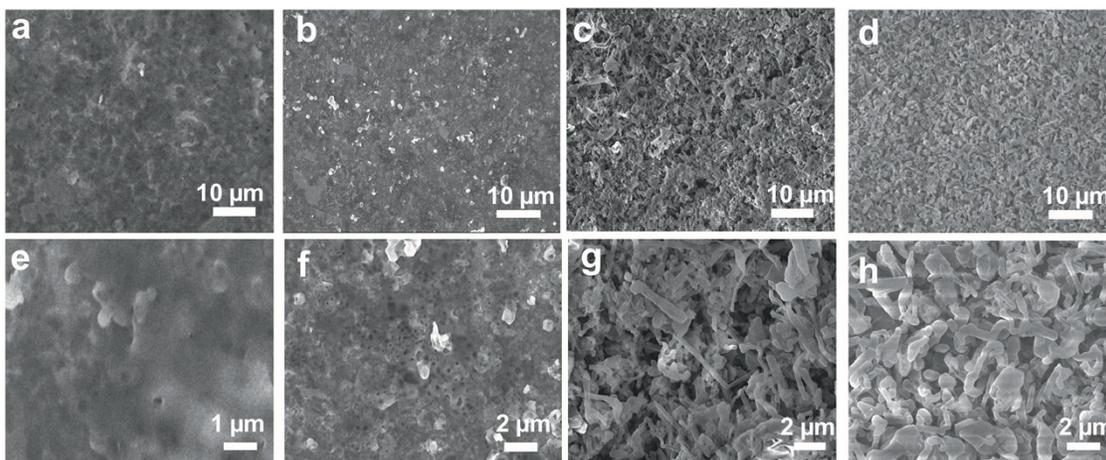


Figure S9. SEM images of Li deposition on the copper substrate of the Li||Cu cells with (a, e) O-PVA-PANI separator (b, f) R-PVA-PANI separator (c, g) O-PVA separator and (d, h) Celgard separator. The Li dripping/stripping process is conducted at the current density of 1 mA/cm², and the capacity for each Li deposition was set to be 1 mA h/cm².

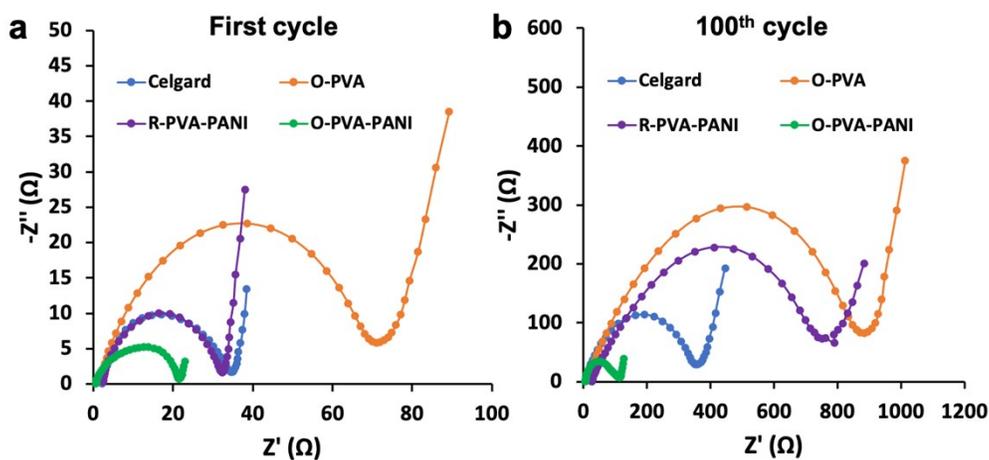


Figure S10. Impedance spectra of Li||LiFePO₄ cells with different separators at first cycle (a) and 100th cycle (b).