Supporting Information

Preparation of chromophore-based polymer films with enhanced lithium ion transport by electrospinning method

LifengGao, [‡ab] Fanghui Zhao, [‡c] Wei Li, [a] Siqi Zhan, [ab] LianfengDuan, [b] Shiwei Wang*[ab] and Mingyao Zhang[a]

[a] School of Chemical Engineering, Changchun University of Technology, Changchun 130012, P. R. China, Email: *wangshiwei@ccut.edu.cn*.

[b] Advanced Institute of Materials Science, Changchun University of Technology, Changchun, 130012, P. R. China.

[C] Key Laboratory of Advanced Structural Materials, Ministry of Education & Anvanced Institude of Materials Science, Changchun Universitry of Technology, Changchun 130012, P. R. China.

‡ The contributions of these authors are equal

*Corresponding author

Materials:

PVDF (Mw=275000 g.mol^{-1}) and N, N-dimethylacetamide (DMAC, analytically pure ≥99.5%) were purchased from Sigma-Aldrich Company. $LiPF_6$ was used as a commercially available electrolyte for lithium-ion battery. DR_1 and DO_{25} were purchased from J&K ScientificTechnology Co. Ltd. All as-prepared materials were used without any further purification.

Fabrication of PVDF/DR_1 Membranes:

PVDF power was dissolved in DMAC/acetone (wt/wt=7:3) solvent by stirring at 50 ℃, then the PVDF/DR_1 mixed solutions can be obtained by adding different proportions of DR_1 into the above solution under stirring. PVDF/DR_1 fiber film was constructed by electrospinning technique with different voltage, then dried at 60 ℃ for 24h in vacuum drying oven. The flowing speed was 0.8ml h^{-1}, and the syringe tip is 18 cm from the base.

Characterization:

The morphology of samples was observed by using a scanning electron microscope (SEM). Raman spectroscopy with 532 nm excitation wavelength is operated at 0.01mW and acquisition time 10s to analysis the influence on the membranes under applied

voltages from 100 to 2000 cm^{-1}.

Surface contact angle test was taken in order to evaluate the wettability of different separators. Note that the water contact angle data is the average of the measurements at different locations on the surface of a film.

The ion conductivity was determined by testing electrochemical impedance spectroscopy (EIS) using CHI600E electrochemical workstation. In the EIS method, the frequency range was from 0.1 Hz to 10^6Hz with a alternating current amplitude of 5 mV at ambient temperature. The ionic conductivity was calculated by using the equation:

$$\sigma = \frac{d}{R_b S} \quad (3)$$

Where σ is the ionic conductivity then Rb represents the bulk resistance. The d denotes the thickness of the membranes and S is the effective contact area of the specimen.

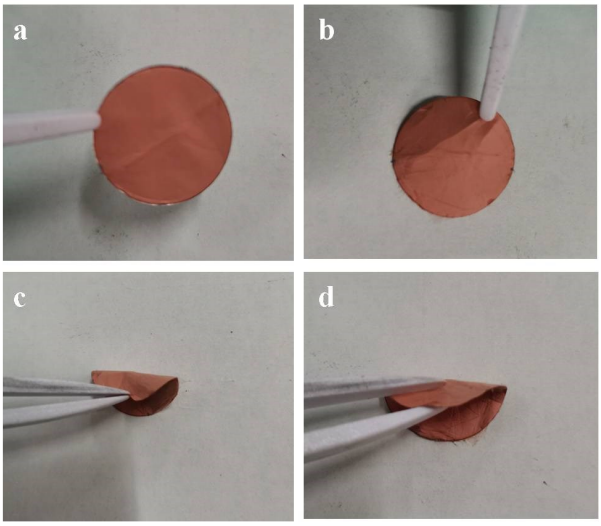

Fig. S1 Photographs of the PVDF/DR1 electrospinning fiber membranes.

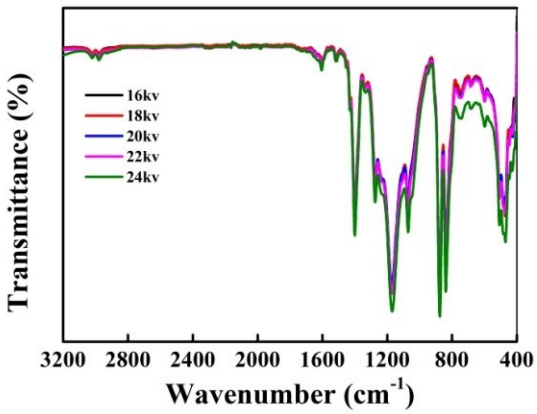

Fig. S2 Infrared spectra of the PVDF/DR1 fiber membranes constructed under different electrospinning voltage.

Table 1. The thickness and Li^+ conductivity of the PVDF/DR1 film constructed under different voltages.

V (kV)	d（μm）	σ（$ms.cm^{-1}$）
16	108	20.79
18	205	37.80
20	360	38.01
22	225	40.63
24	266	56.25