Electronic supplement information (ESI)

Sandwich structured PVdF/PMIA/PVdF nanofibrous separators with robust mechanical strength and thermal stability for lithium ion battery

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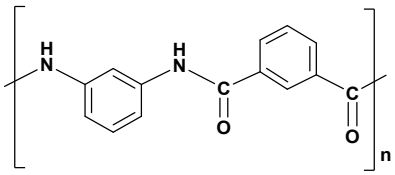

Fig. S1 Chemical structure of PMIA.

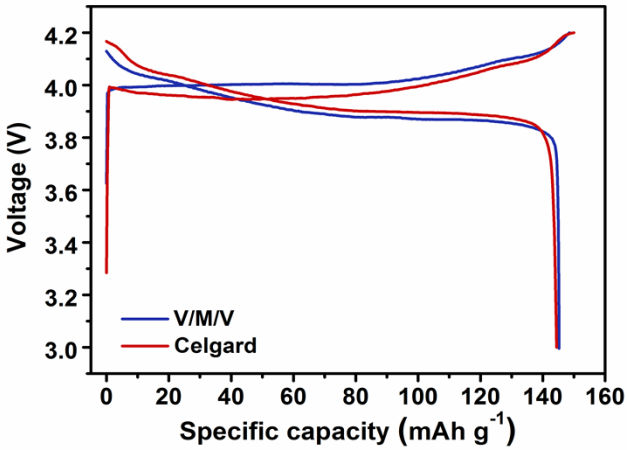

Fig. S2 Initial charge-discharge curves of the cells with the composite membranes and Celgard membrane as separators at 0.1C rate.

The initial cycle charge-discharge properties at a current density corresponding to 0.1C rate are shown in Fig. S2. It can be seen that the curves for coin cells with various separators are very similar, and smooth sloping voltage profiles are observed. The first cycle discharge capacities of the cell based on the V/M/V composite membranes and Celgard membranes are 145.32 and 144.47 mAh g^{-1}, with the utilization of the active material are 97.24% and 96.32%, respectively. The discharge capacity of the cell with resultant composite membranes is slightly higher compared to the cell with Celgard membrane, which may be owing to the higher ionic conductivity of the composite membranes.

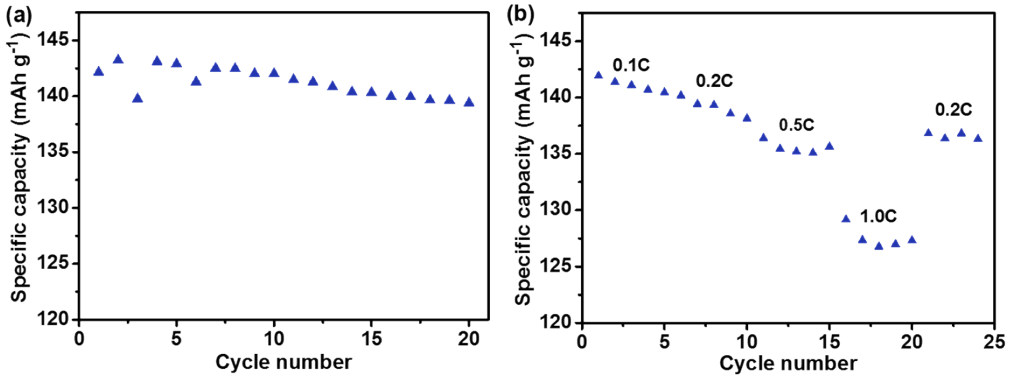

Fig. S3 Cycle performance (a) and rate capability (b) of the cells assembled with the resultant composite membranes at 80 °C.

Fig. S3 shows the cycle performance and rate property of the Li/$LiCoO_2$ cell using the electrospun V/M/V composite membranes at 80 °C. As demonstrated in Fig. S3a, the cell with composite membranes delivers initial discharge capacity of 142.16 mAh g^{-1}, and shows a stable cycling performance, with the discharge capacity of 139.40 mAh g^{-1} (the capacity retention is 97.78%) after 20 cycles at 0.2C rate. Moreover, the discharge capacity of the cell based on the composite membranes decreases with the increasing C-rate as shown in Fig. S3b. Even at the high discharge current density (1.0C rate), the cell exhibits a discharge capacity up to 127.46 mAh g^{-1}, which maintains 89.80% of the initial capacity at 0.1C rate. The excellent discharge performance for the V/M/V composite membranes can be ascribed to the heat tolerance and mechanical stability of the PMIA fibers, especially when suffering a high temperature of 80 °C. The results demonstrate that the V/M/V composite membranes would be beneficial for improving the safety characteristics of lithium ion battery.