

## Supporting Information

### **Self-shutdown function Induced by Sandwich-like Gel Polymer Electrolytes for High Performance Lithium Metal Batteries\**

Binxuan Xie<sup>a</sup>, Shimou Chen<sup>b,\*</sup>, Yong Chen<sup>c</sup>, Lili Liu<sup>a,\*</sup>

<sup>a</sup>Key Laboratory of Cosmetic, China National Light Industry, College of Chemistry and Materials Engineering, Beijing Technology and Business University, Beijing, 100048, China

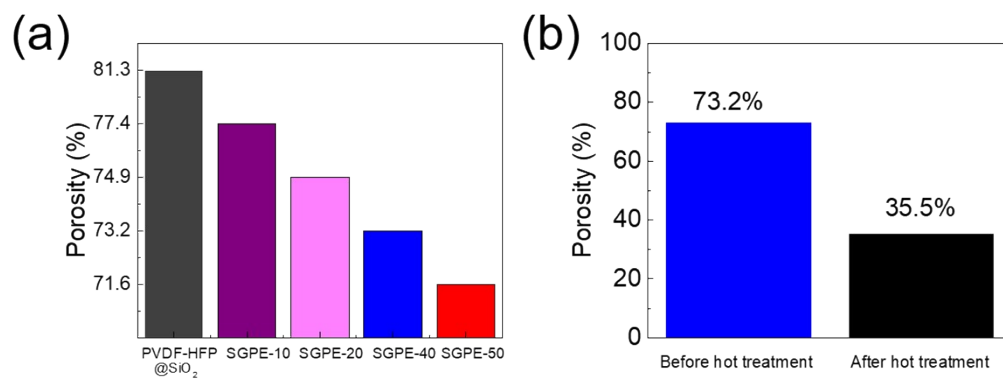
<sup>b</sup>Beijing Key Laboratory of Ionic Liquids Clean Process, CAS Key Laboratory of Green Process and Engineering, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, 100190, PR China

<sup>c</sup>School of Chemical & Environmental Engineering, China University of Mining & Technology, Beijing 100083, China.

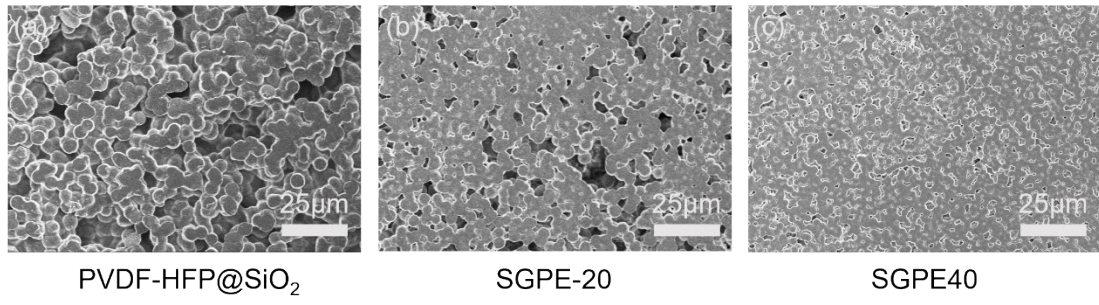
Corresponding author email: Lili Liu ([liulili@btbu.edu.cn](mailto:liulili@btbu.edu.cn)), Shimou Chen ([chenshimou@ipe.ac.cn](mailto:chenshimou@ipe.ac.cn))



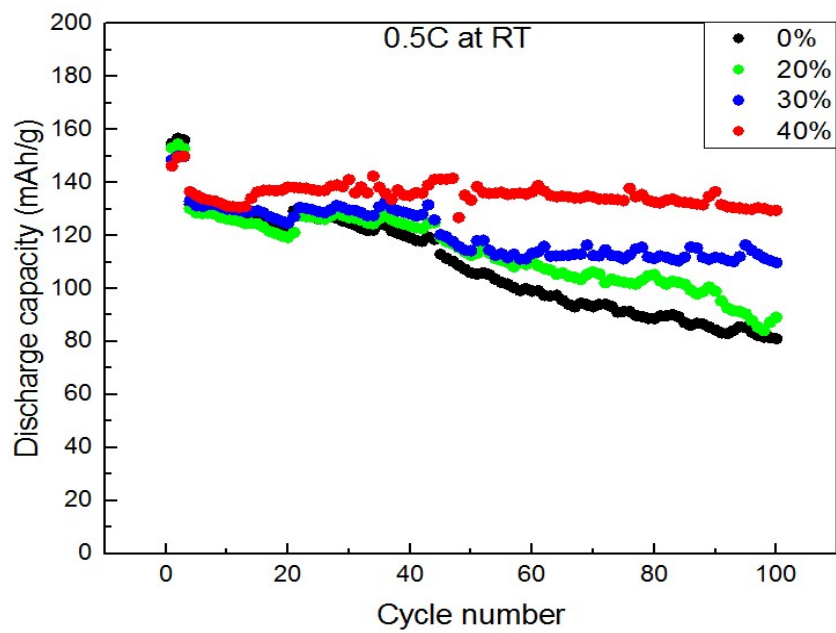
**Fig. S1** Image of gelled SGPE-40.



**Fig. S2** (a) Porosity of PVDF-HFP@SiO<sub>2</sub>, SGPE-10, SGPE-20, SGPE-30, SGPE-40, SGPE-50, (b) Porosity of SGPE-40 before and after hot treatment.



**Fig. S3** Influence of different monomer content on membrane pore size



**Fig. S4** Cycle performance of LFP/Li cell using SGPE with different PETEA monomer at 25 °C.

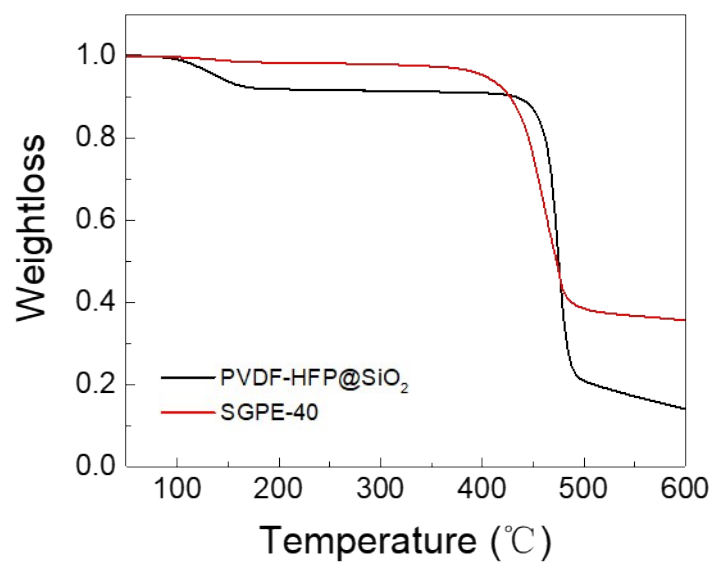
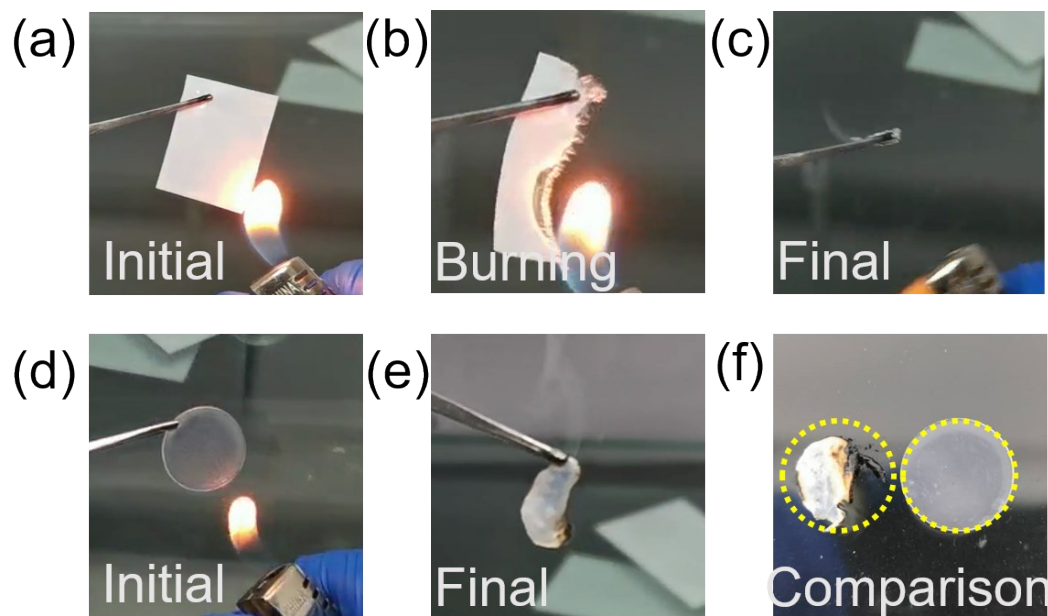
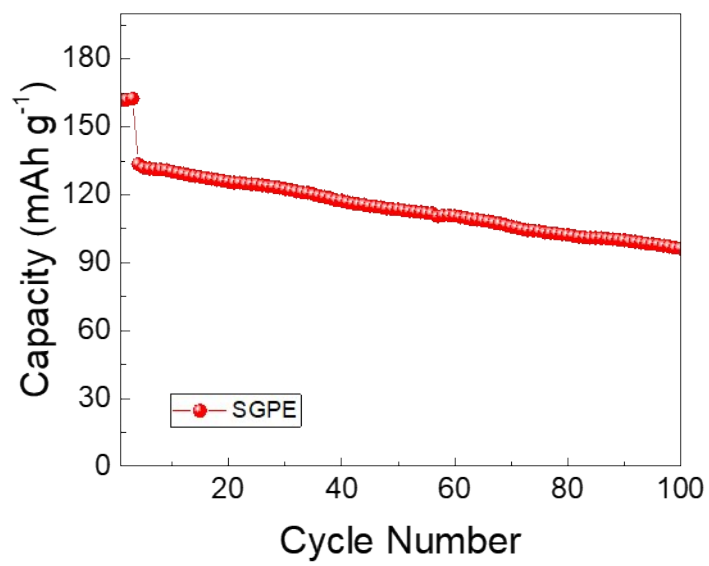


Fig. S5 TGA curves of PVDF-HFP@SiO<sub>2</sub>, SGPE-40.

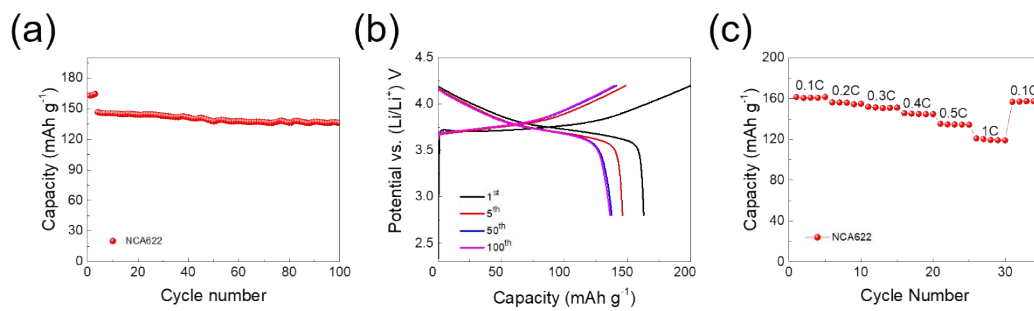


**Fig. S6** Snapshots taken when the Celgard 2400 and SGPE-40 membrane saluted with liquid electrolyte (20  $\mu$ L) were exposed to the flame.

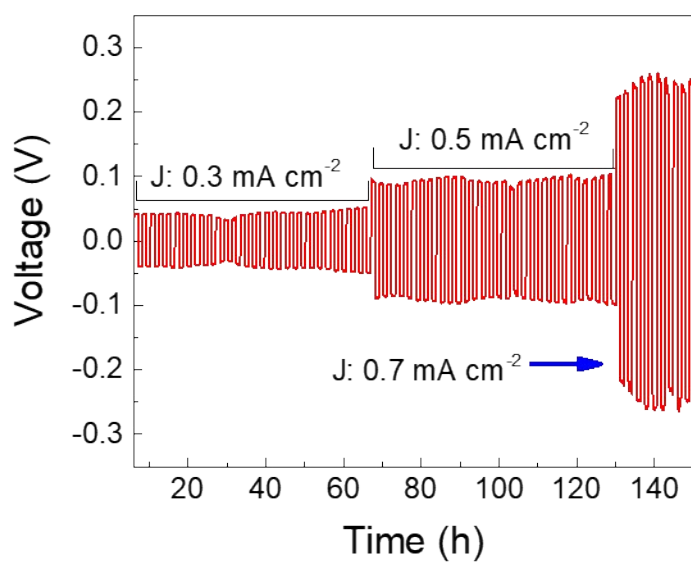


**Fig. S7** Cycle performance of the LFP/SGPE-40/Li cells at a rate of 2 C at 25 °C.

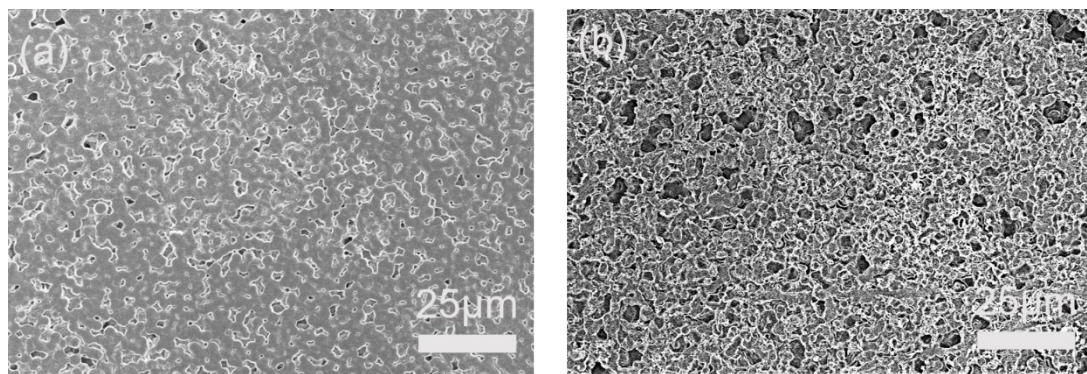




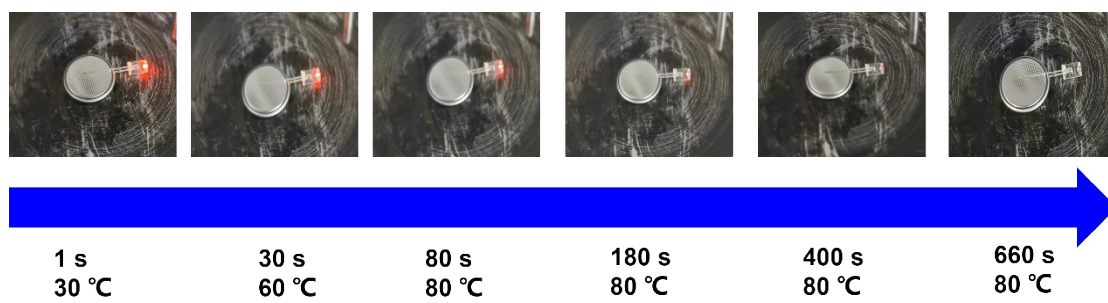
**Fig. S8** Cycle performance (a), voltage-capacity profile (b) and rate performance of the NCA/SGPE/Li cells at 25°C.



**Fig. S9** Voltage profiles for the Li symmetrical cell using SGPE-40 during lithium plating/stripping at current densities of 0.3, 0.5 and 0.7 mA cm<sup>-2</sup> with capacity of 0.3, 0.5 and 0.7 mAh cm<sup>-2</sup> at 25 °C.



**Fig. S10** Surface morphologies of the SGPE-40 before (a) and after cycling tests (b).



**Fig. S11** Images of the LED with the prepared battery when increasing temperature.