Supplementary Materials

Nanopore Separator of Crosslinked Poly (Propylene Glycol)-*co*-Pentaerythritol Triacrylate for Effectively Suppressing the Polysulfide Shuttle in Li-S battery

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Fig. S1 The N_2 adsorption/desorption isotherms of the UV-synthesized PPG-*co*-PETA cross linked nanoparticles: (a) DC = 77%, and (b) DC% = 61%, and (c) DC% = 59%, and (d) DC% = 43% and (e) DC% = 12%.

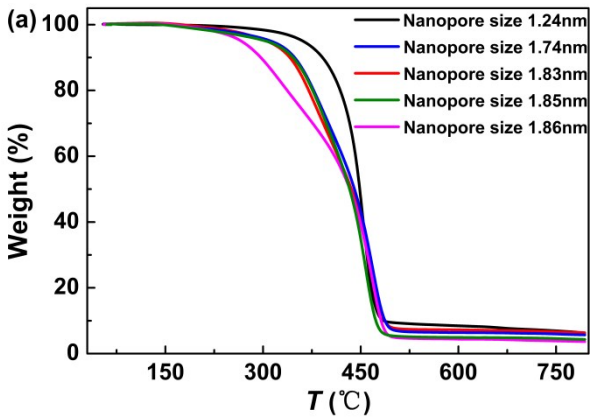

Fig. S2 The thermogravimetric (TG) curves of the cross linked polymer with different nanopore size.

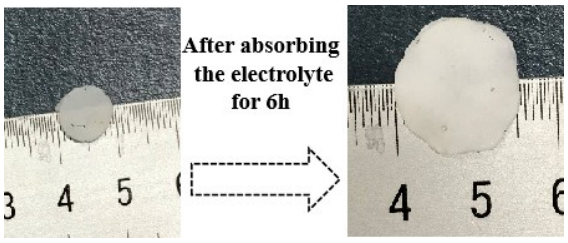

Fig. S3 The digital photographs of the PPG-*co*-PETA nanopore separator(with nanopore size of 1.24nm) before and after absorbing the electrolyte.

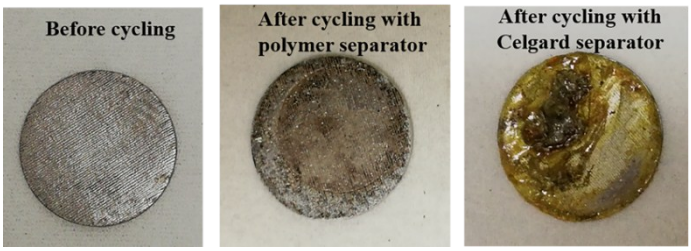

Fig. S4 The optical photographs of the Li anodes harvested from the Li-S batteries before or after 200 cycles with different separators at 0.25C.

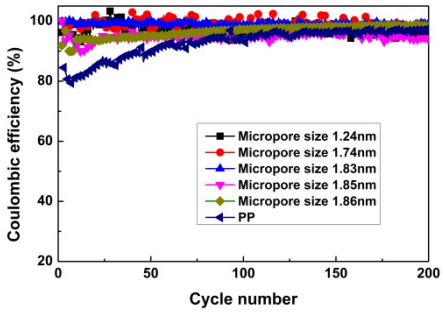

Fig. S5 The coulombic efficiency of Li-S batteries using PPG-*co*-PETA separator with different nanopore size, compared with the case of using Celgard separator.

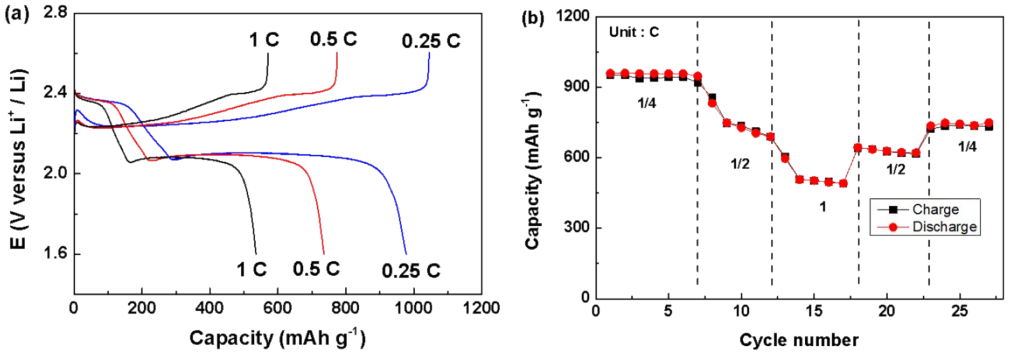

Fig. S6 The Li–S battery performance of the PPG-*co*-PETA separator of nanopore size of ~1.24nm. (a) the discharge charge curves and (b) cycling performances at various C rates.

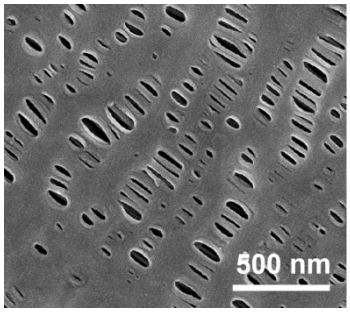

Fig. S7 The SEM image of the Celgard separator.

Table. S1 Components of synthesized PPG-*co*-PETA

Component / No.	*wt*(PO) /%	*wt*(PETA) /%	*wt*(DMPA) /%	*wt*(IHT-PI810) /%
1	95.25	3.75	0.25	0.75
2	91.50	7.50	0.25	0.75
3	84.00	15.00	0.25	0.75
4	91.00	7.50	-	1.50
5	91.50	7.50	1.00	-

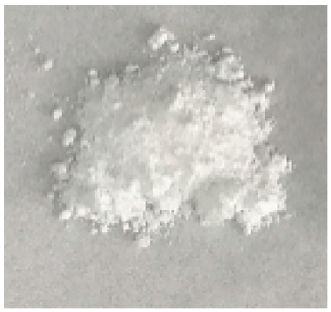

Fig. S8 The optical photograph of the UV-synthesized PPG-*co*-PETA

Preparation of the cathode

The preparation procedure of the super P/sulfur composite as follows: Firstly, to introduce massive sulfur element into the super P((S_{BET} = 2000 m^2/g), Kejing), the procedure is conducted as follows: 2.9 g of $Na_2S_2O_3 \cdot 5H_2O$ was dissolved in 20mL distilled water containing 0.15 g super P, then, 15mL 4.20 M HCl was added dropwise into the mixture when stirred, after stirring for 24 h at room temperature, the solution was filtered, washed and dried at 60 °C for 24 h, so the resulting super P/sulfur composite was obtained. Secondly, the super P/sulfur composite, acetylene black (Kejing, Co. Ltd, Shenzhen) and polyvinylidene fluoride (PVDF, Kejing Co. Ltd, Shenzhen) (8:1:1 by weight) were mixed in N-methyl pyrrolidone (NMP, AR, Aladdin reagent) and further stirred for 24 h, then the slurry was spread on aluminum foil by a coater, with removing the NMP in vacuum oven at 70 °C for 24 h, following by cutting into the diameter of 12mm cathode.

To determine the sulfur content of the composite, the thermography analysis, the scanning electron microscope (SEM) images and corresponding elemental mapping images were conducted as **Fig. S9-S10**, which showed the sulfur mass percentage was about 63.9%.

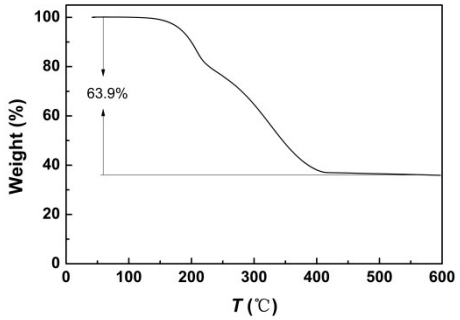

Fig. S9 The TGA curve of super P/sulfur composite.

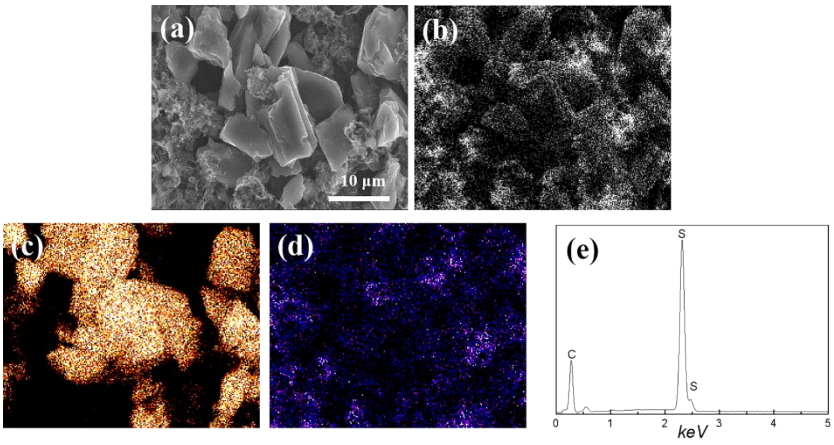

Fig. S10 Characterizations of the cathode: (a) SEM image and the corresponding elemental mapping images of (b) C, (c) S and (d) F, respectively, and (e) EDS spectrum.

Fig. S11 Variation of current with time during polarization of (a) the Li/PPG-*co*-PETA separator (DC% = 77%) / Li configuration at the applied potential of 1mV and (b) the impedance spectra before and after polarization.