Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Facile Preparation of Ultrafine Ti_4O_7 Nanoparticles-embedded Porous Carbon with High-Areal-Sulfur Loading for Lithium Sulfur Batteries

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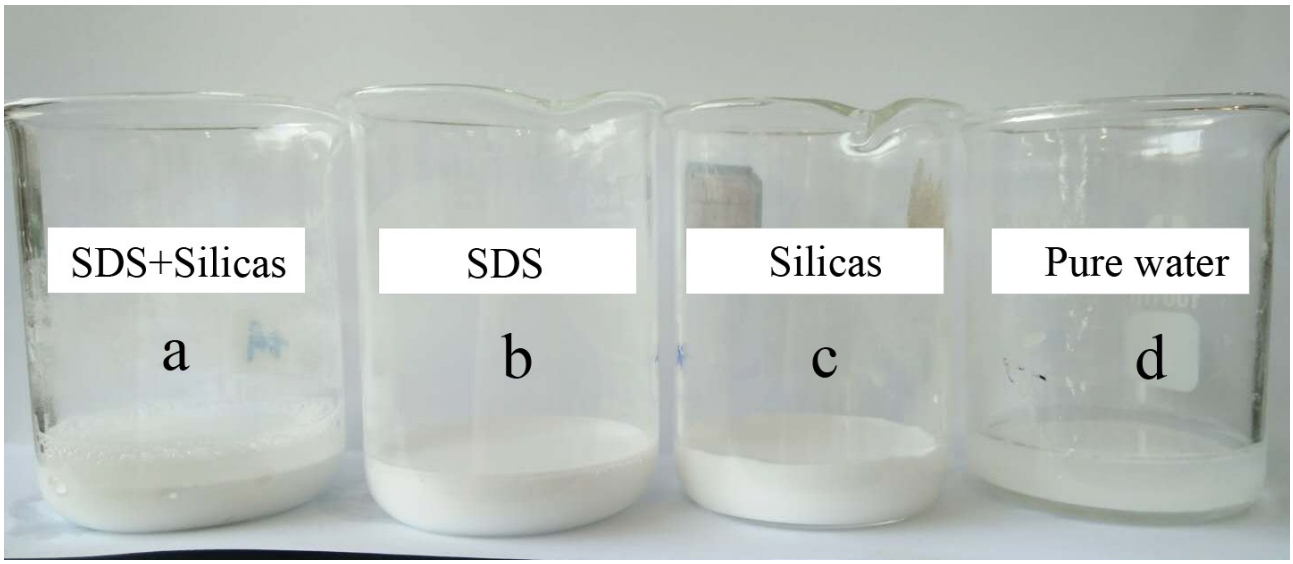

Fig. S1 Dispersion experiment (a) The mixed solution of silica colloidal solution, TiO_2 nanoparticles and SDS. (b) Deionized water with SDS and TiO_2 nanoparticles. (c) Silica colloidal solution with TiO_2 nanoparticles. (d) Pure deionized water with TiO_2 nanoparticles.

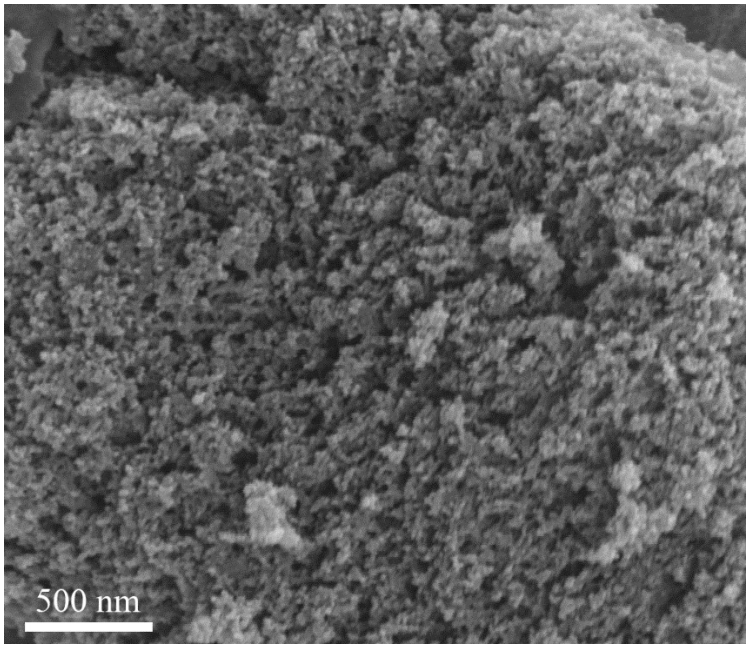

Fig. S2. The SEM image of as-prepared PC@Ti_4O_7.

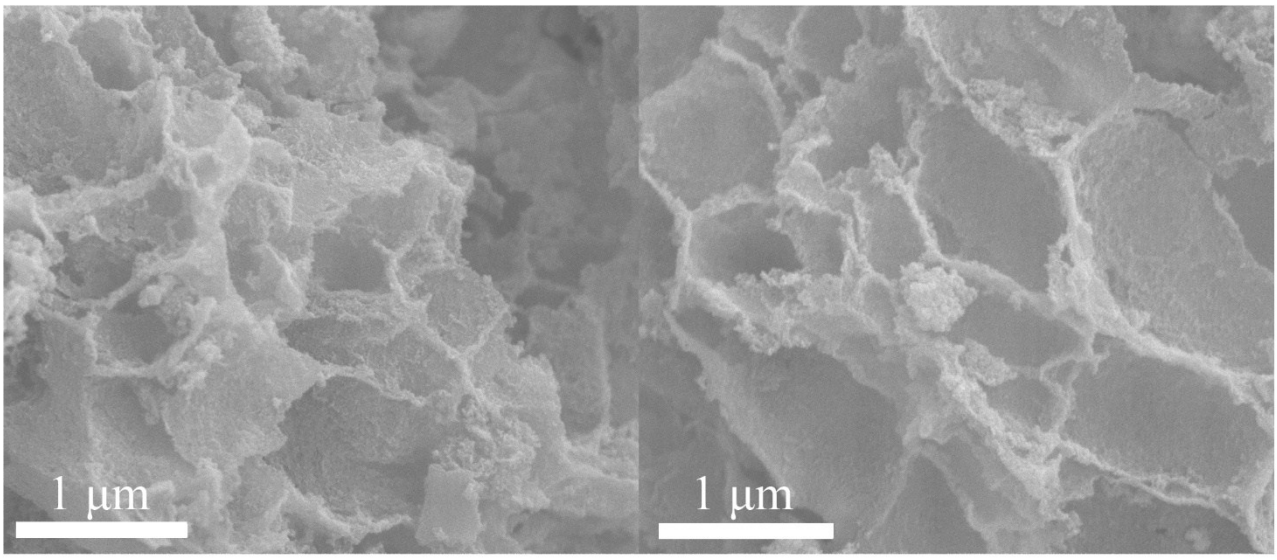

Fig. S3. The SEM images of broken large shelled pores.

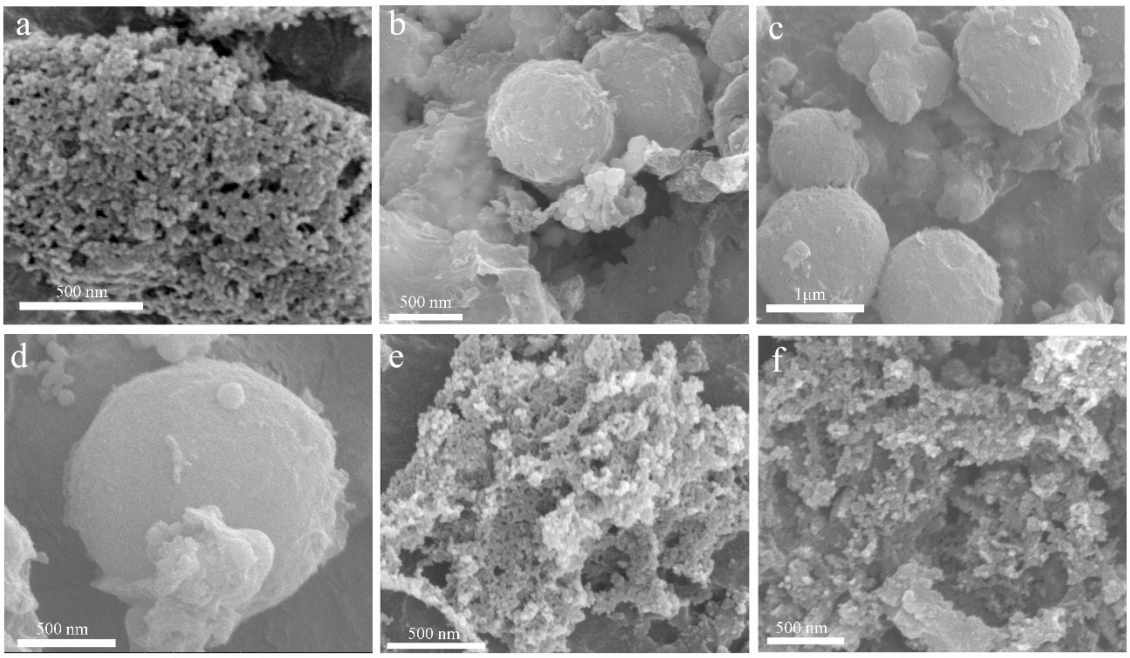

Fig. S4. The SEM images of four control samples. (a) PC@Ti_4O_7-1, (b-c) PC@Ti_4O_7-2, (e) PC@TiO_2, (f) PC.

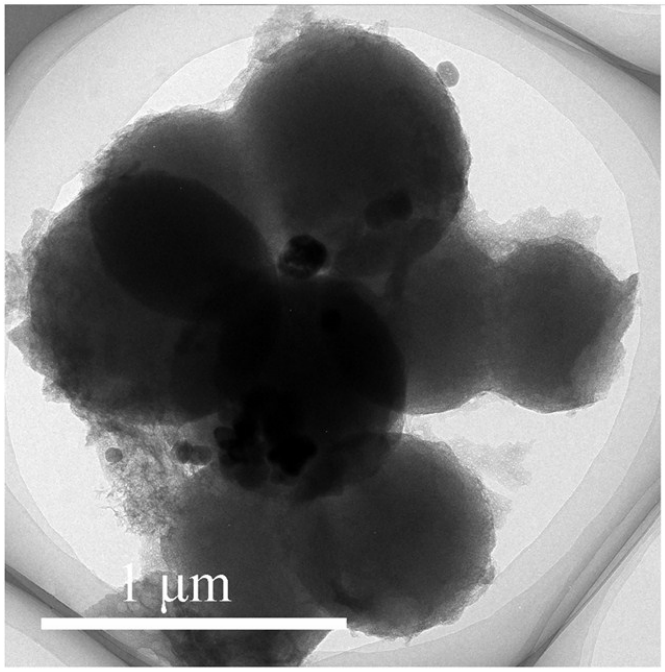

Fig. S5. The TEM image of carbon spheres in PC@Ti_4O_7-2.

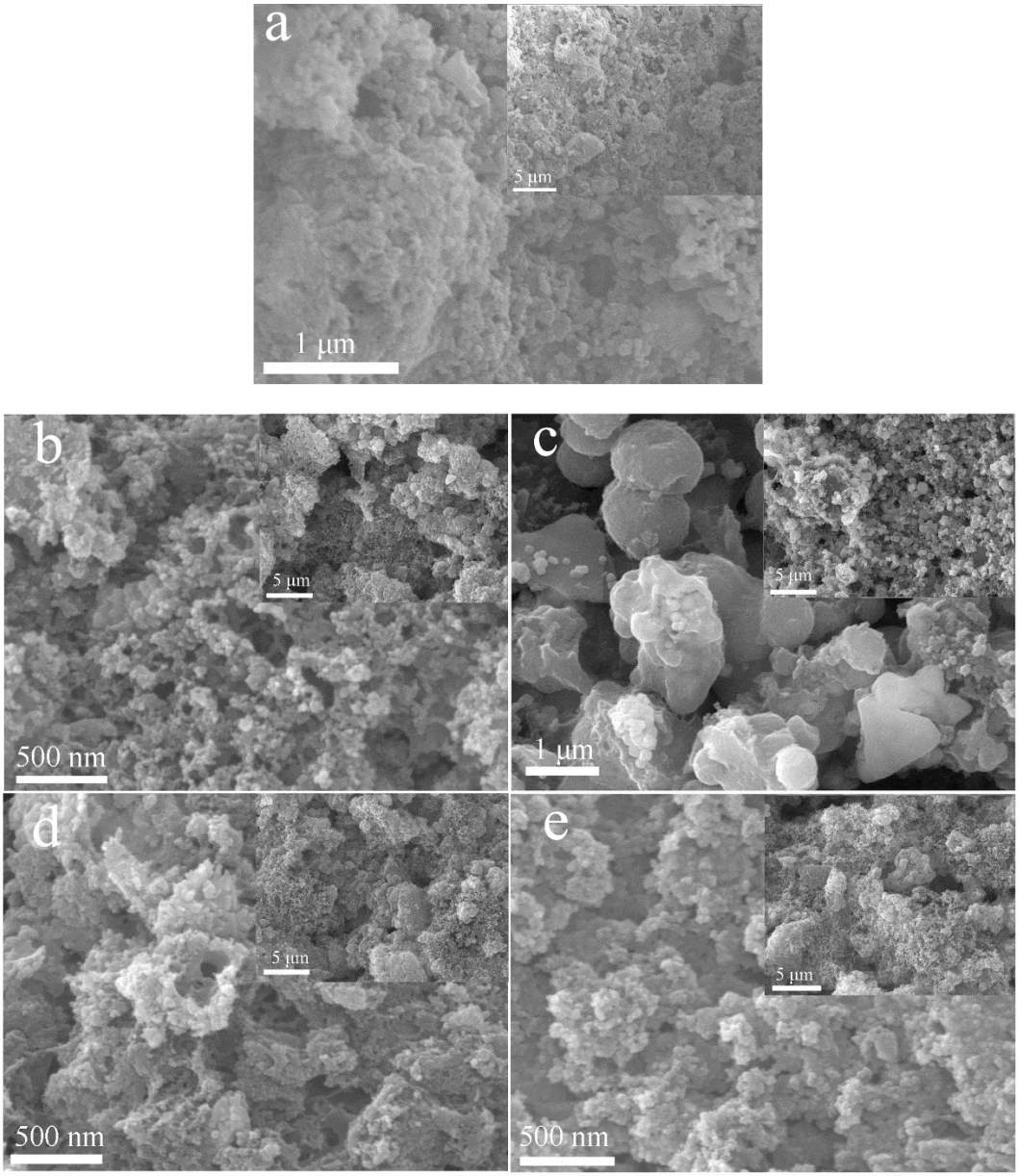

Fig. S6. The SEM images of as-prepared electrode films. (a) PC@Ti_4O_7-S electrode, (b) PC@Ti_4O_7-1-S electrode, (c) PC@Ti_4O_7-2-S electrode, (d) PC@TiO_2-S electrode, (e) PC-S electrode.

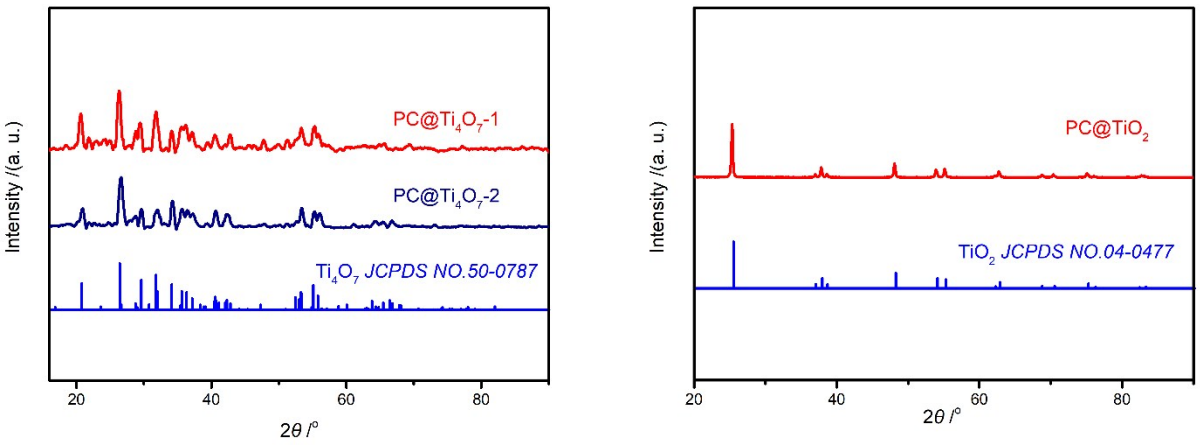

Fig. S7. The XRD patterns of PC@Ti_4O_7-1, PC@Ti_4O_7-2 and PC@TiO_2.

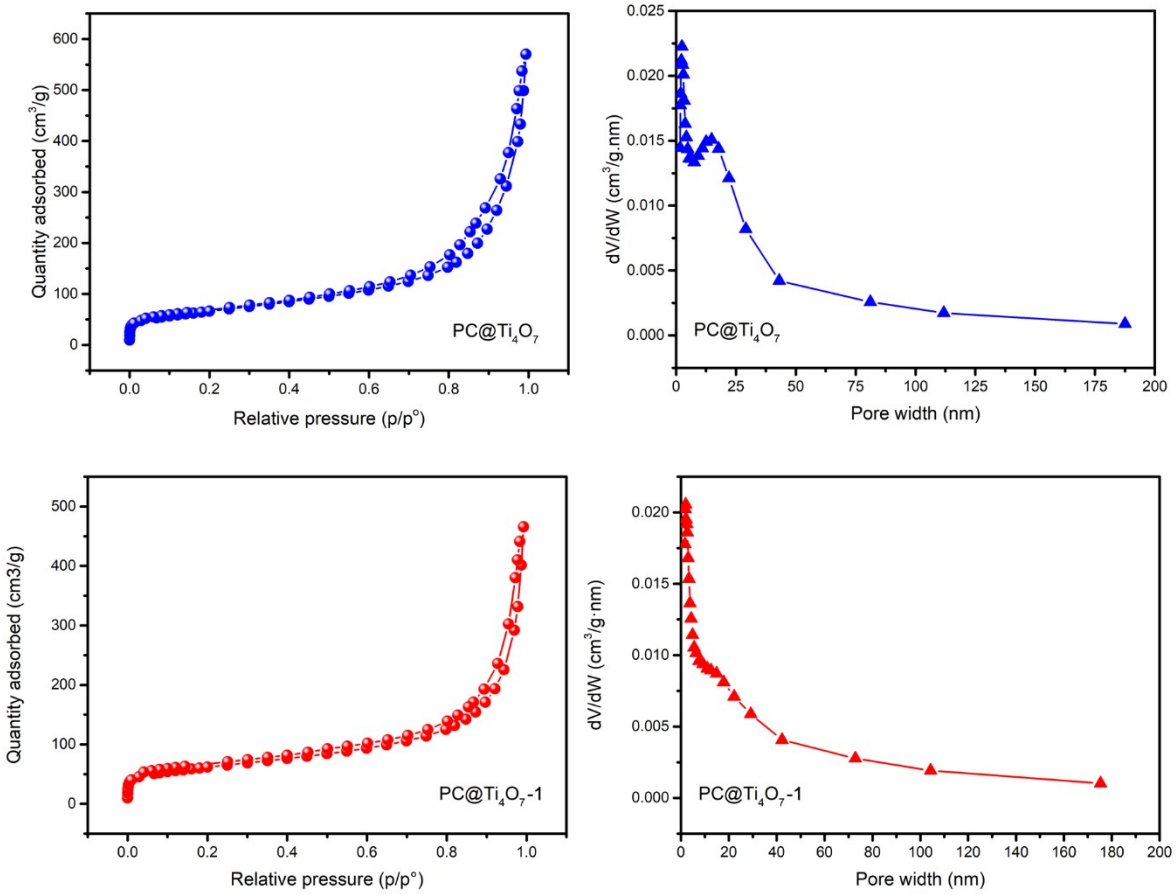

Fig. S8. N_2-sorption isotherms and pore-size distribution of the PC@Ti_4O_7 and PC@Ti_4O_7-1 composites.

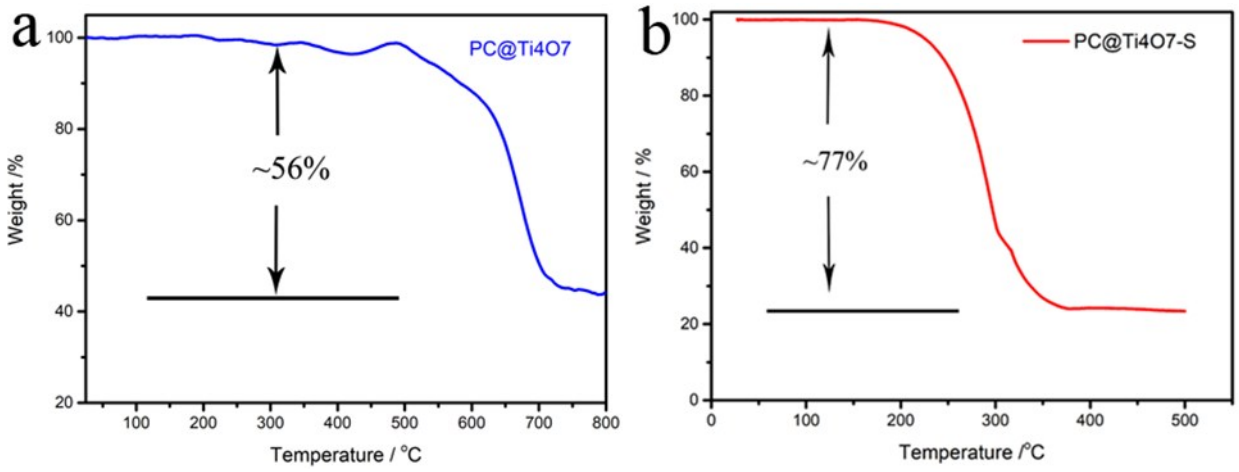

Fig. S9. Thermogravimetric analysis of Ti_4O_7 and elemental sulfur.

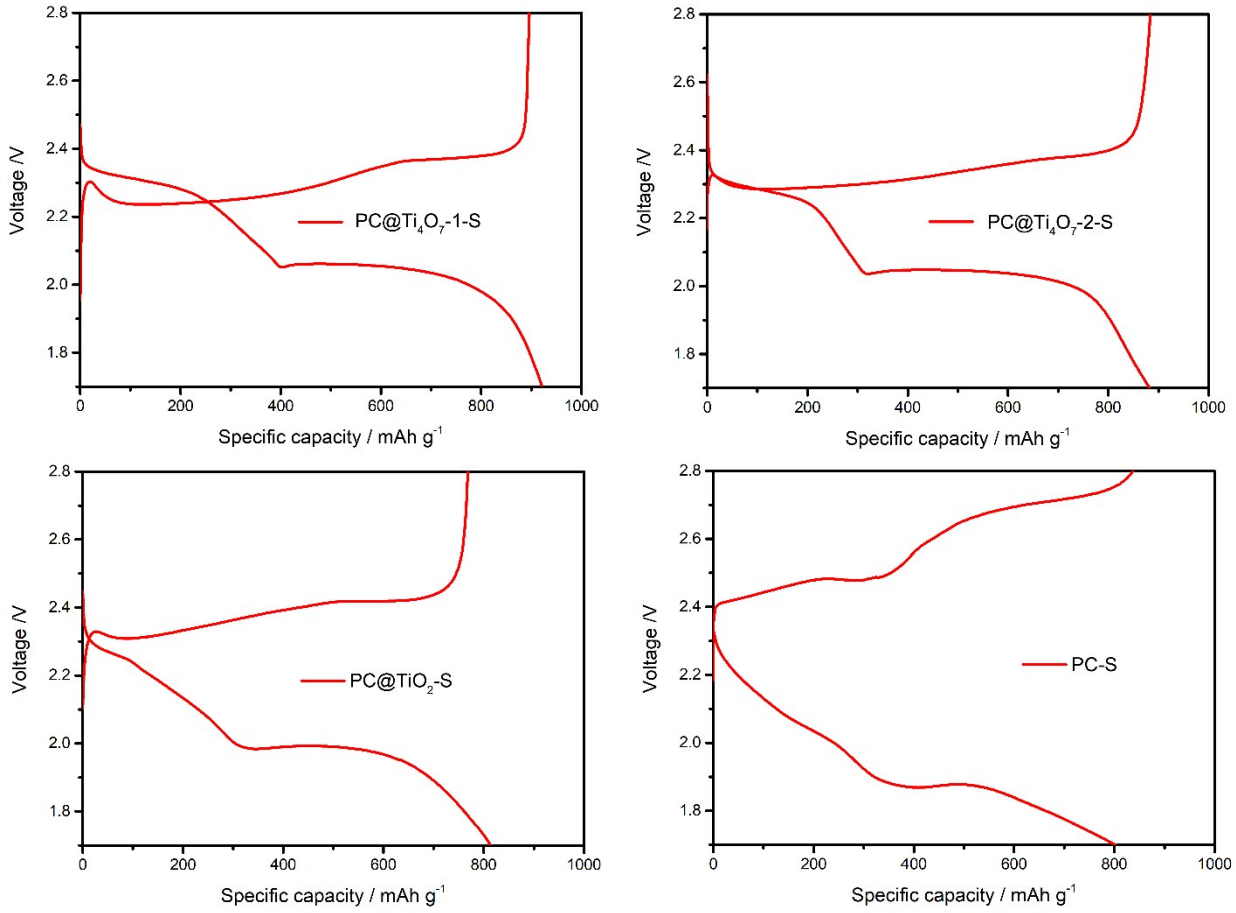

Fig. S10. The galvanostatic profiles of other four control samples at 1 C.

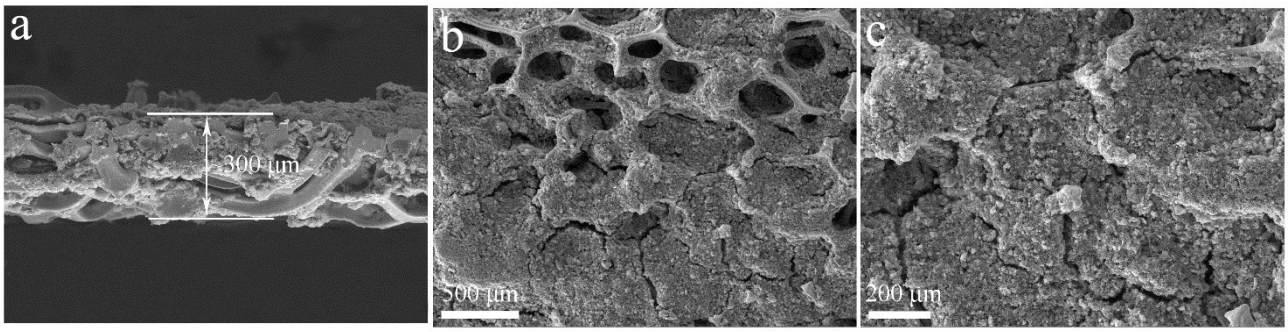

Fig. S11. (a) The thickness of high sulfur loading electrodes. (b-c) SEM images of thick PC@Ti_4O_7-S electrodes.

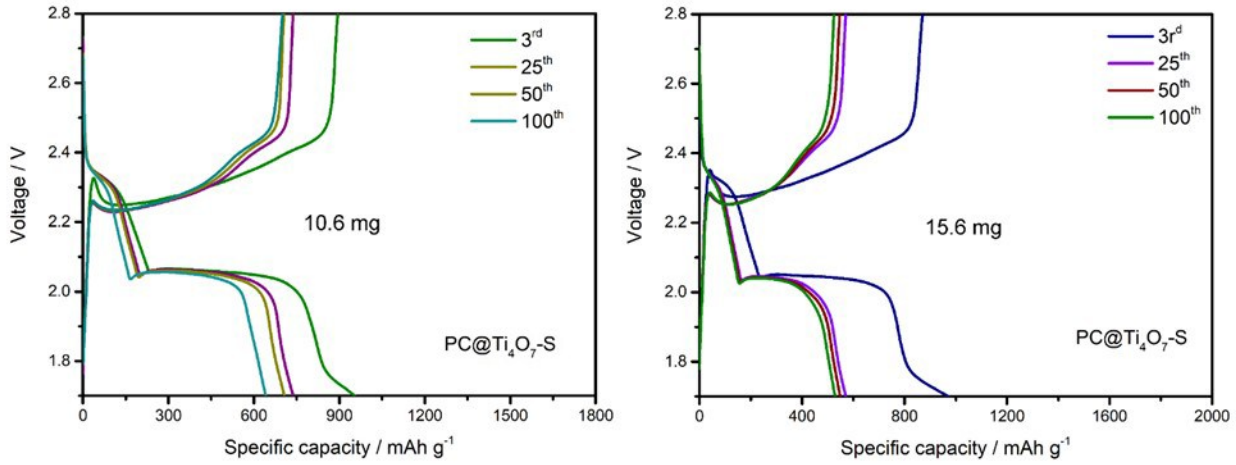

Fig. S12. The galvanostatic charge-discharge curves of PC@Ti_4O_7-S cathodes with 10.6 and 15.6 mg cm^{-2} sulfur after different cycles.

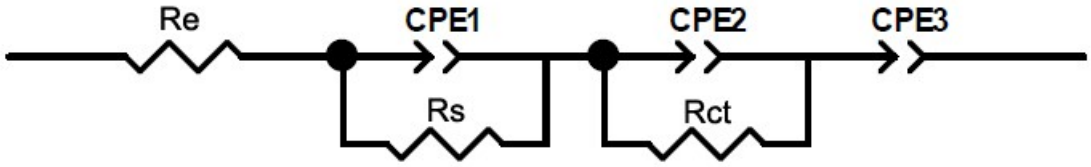

Fig. S13. Equivalent circuit modal of the Nyquist plots.

Table S1. EIS test results of PC@Ti_4O_7-S and PC-S cathode before and after cycles.

	Cathode	R_e (Ω)	R_s (Ω)	R_{ct} (Ω)	Warburg coefficient
Before cycles	PC@Ti_4O_7-S	1.8	31.3	6.3	14.3
	PC-S	2.6	52.7	24.9	22.2
After cycles	PC@Ti_4O_7-S	7.9	12.5	2.2	8.0
	PC-S	2.9	25.1	6.4	10.3

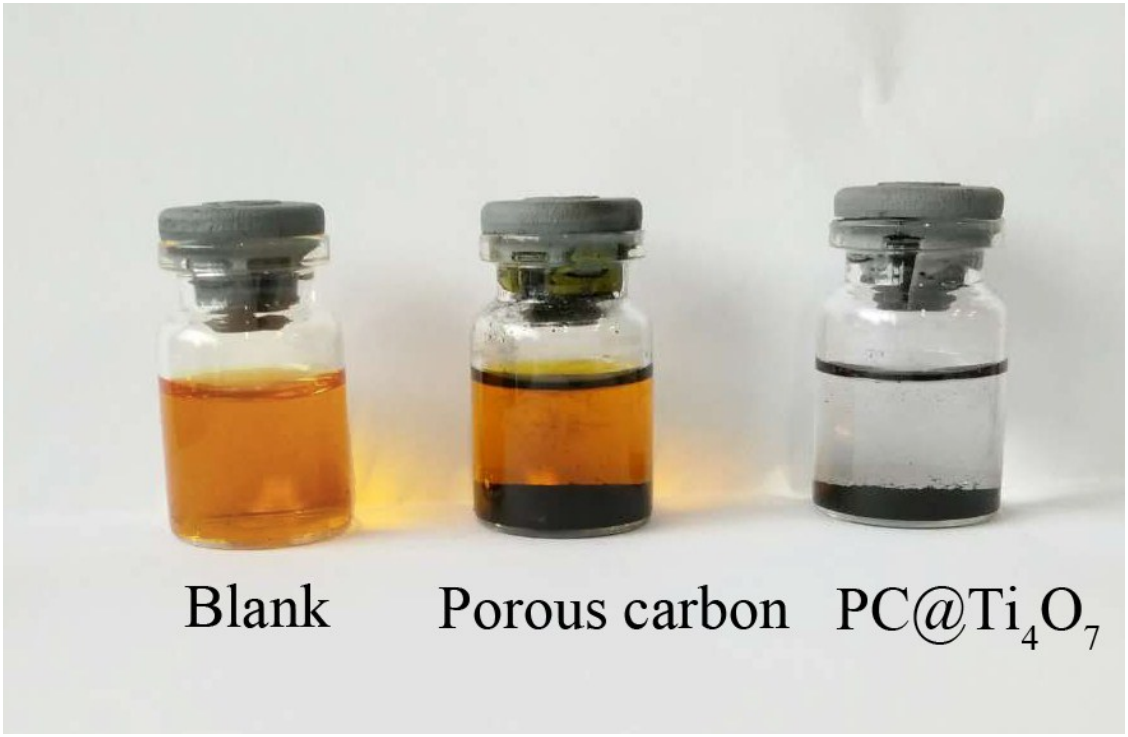

Fig. S14. Visualized adsorption of Li_2S_4 on porous carbon and PC@Ti_4O_7 with the same amount.

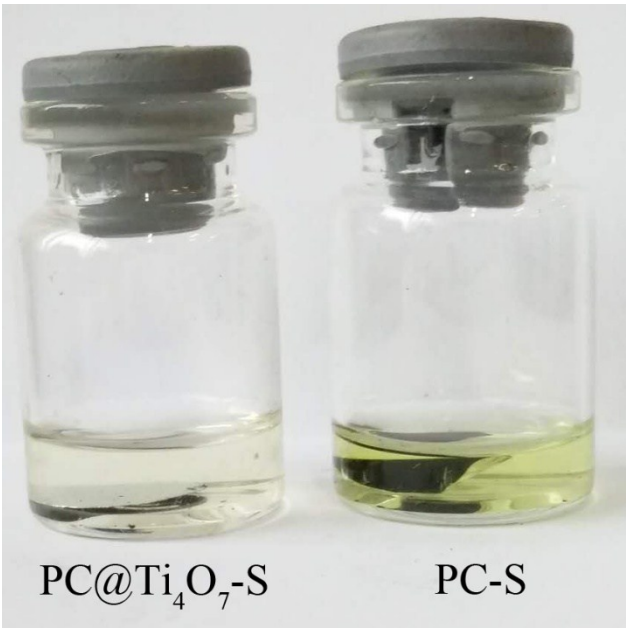

Fig. S15. The long-term cycled PC@Ti_4O_7-S and PC-S cathodes soaked in mixed DOL/DME solvent.

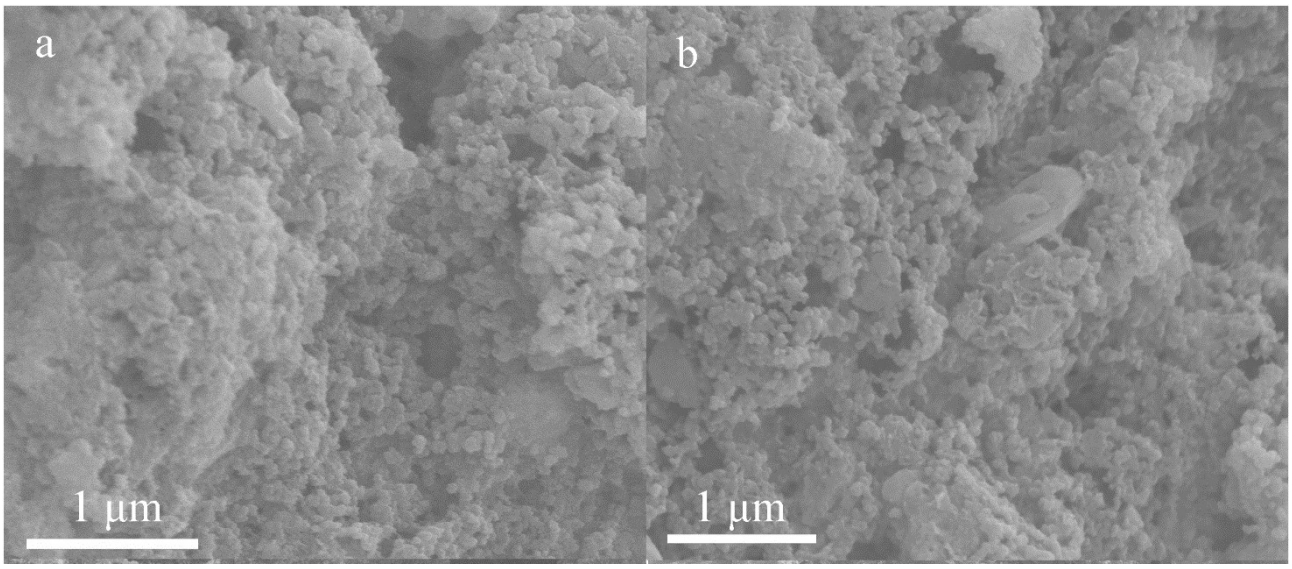

Fig. S16. (a) The SEM images of fresh PC@Ti_4O_7-S cathode. (b) The cycled PC@Ti_4O_7-S cathode.