

Supporting Information

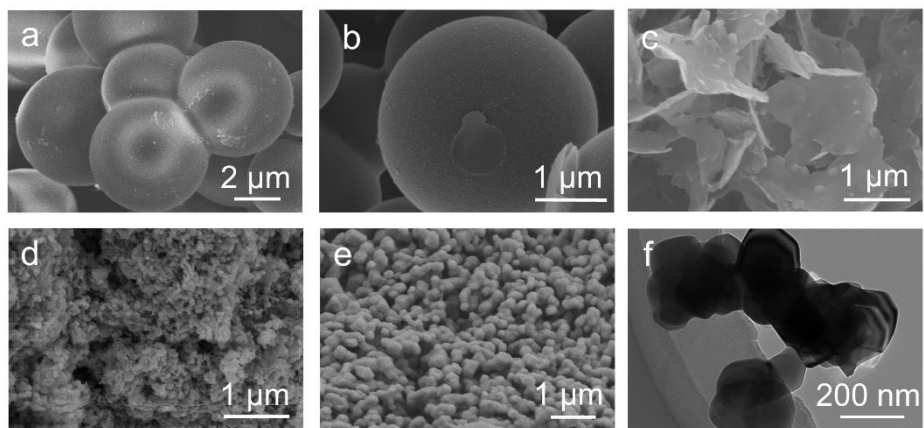
## **An interlayer composed of porous carbon sheet embedded with TiO<sub>2</sub> nanoparticles for stable and high rate lithium-sulfur batteries**

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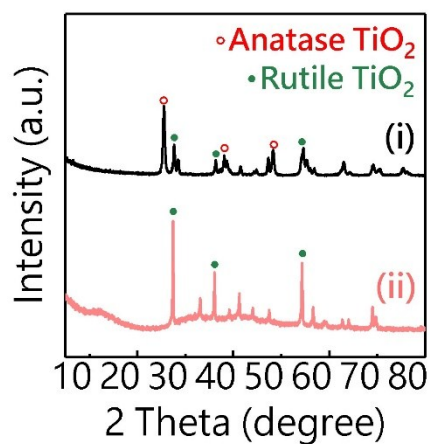
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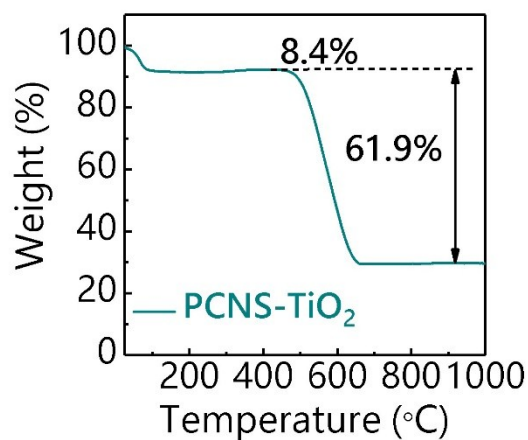
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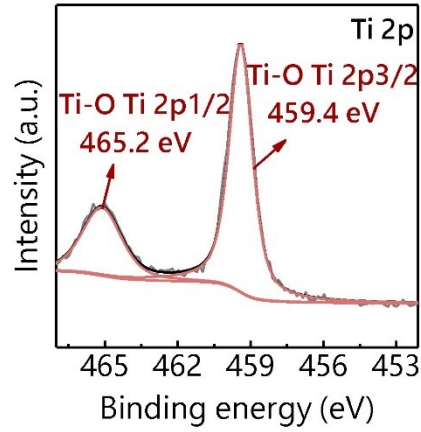
**Fig. S1** SEM images of PCS before (a) and after (b) the heat treatment, (c) CNS-Ti<sub>3</sub>C<sub>2</sub>T<sub>x</sub> and (d) TiO<sub>2</sub> obtained after hydrothermal treatment. (e) SEM and (f) TEM images of TiO<sub>2</sub> after the heat treatment.



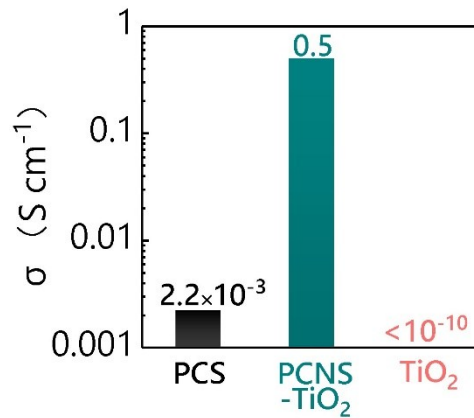
**Fig. S2** XRD patterns of TiO<sub>2</sub> (i) after hydrothermal treatment and (ii) after annealing at 900 °C.



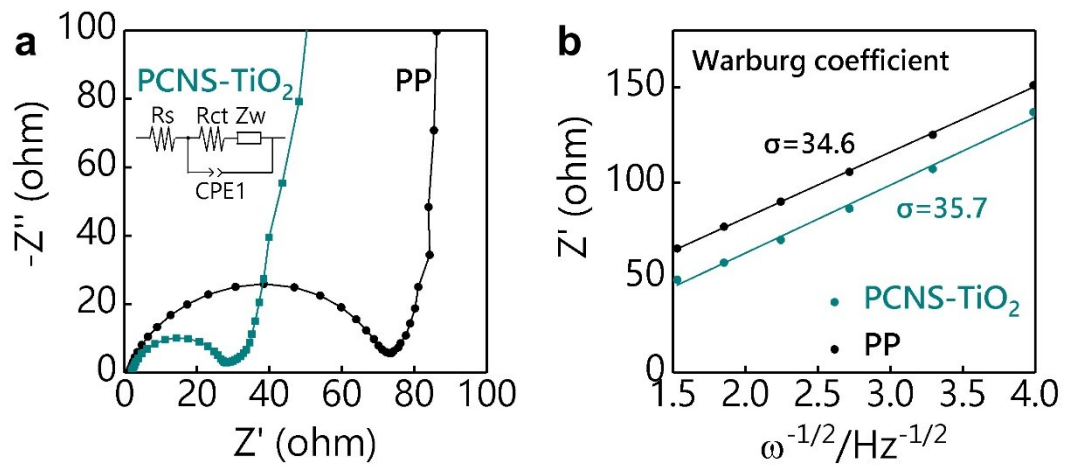
**Fig. S3** TG profile of PCNS-TiO<sub>2</sub> in the atmosphere, showing the TiO<sub>2</sub> content is about 32.4 wt%.



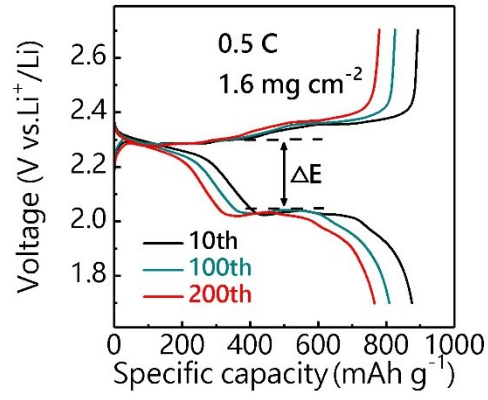
**Fig. S4** Ti 2p XPS spectrum of PCNS-TiO<sub>2</sub>.



**Fig. S5** Electrical conductivities of PCS, PCNS-TiO<sub>2</sub> and TiO<sub>2</sub> interlayers on the separators measured by a four-point probe method.



**Fig. S6** (a) EIS plots and (b) the calculated Warburg coefficients of Li-S batteries with PP separator and PCNS-TiO<sub>2</sub> coated separator.



**Fig. S7** Galvanostatic charge/discharge profiles at 0.5 C of the Li-S battery with the PCNS-TiO<sub>2</sub> interlayer with the sulfur loading of 1.6 mg cm<sup>-2</sup>.