Electronic Supplementary Information (ESI) for

Organic polythiophene coated aromatic polyimide composite cathodes for ultrafast and sustainable lithium ion batteries†

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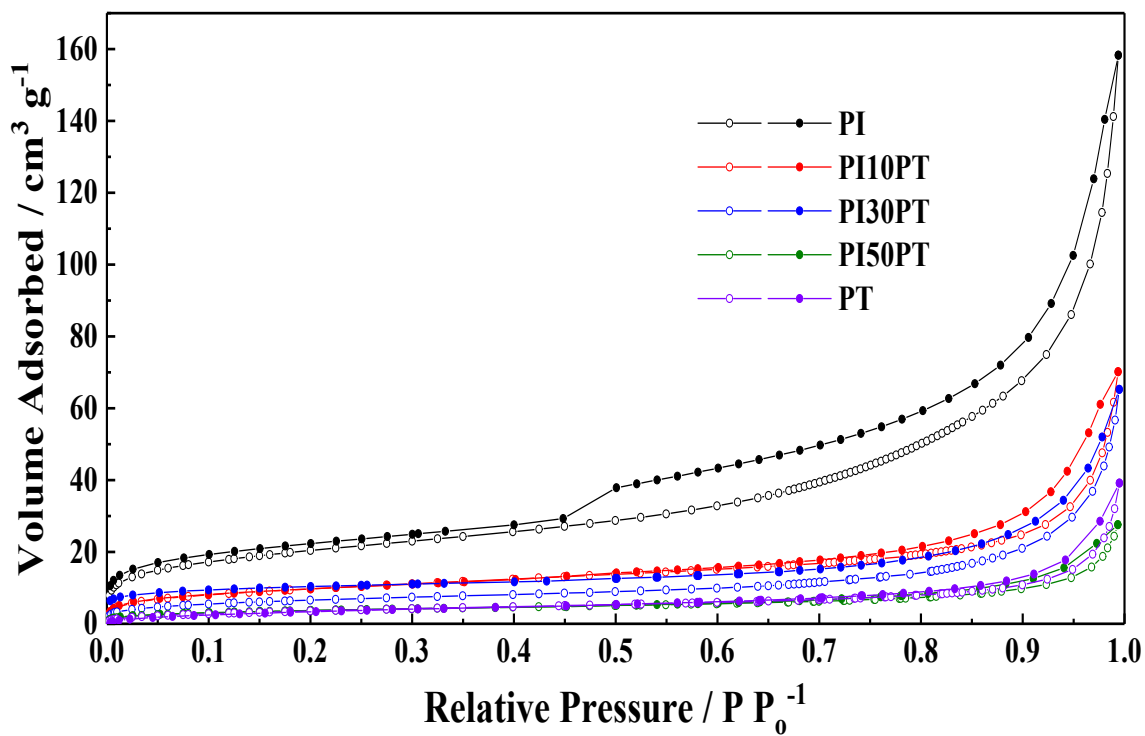Tel.: +86-531-88390236 (J. L.); 865-241-8822 (X. S.).

Fig. S1. N_2 adsorption-desorption isotherms of PI, PI10PT, PI30PT, PI50PT and PT.
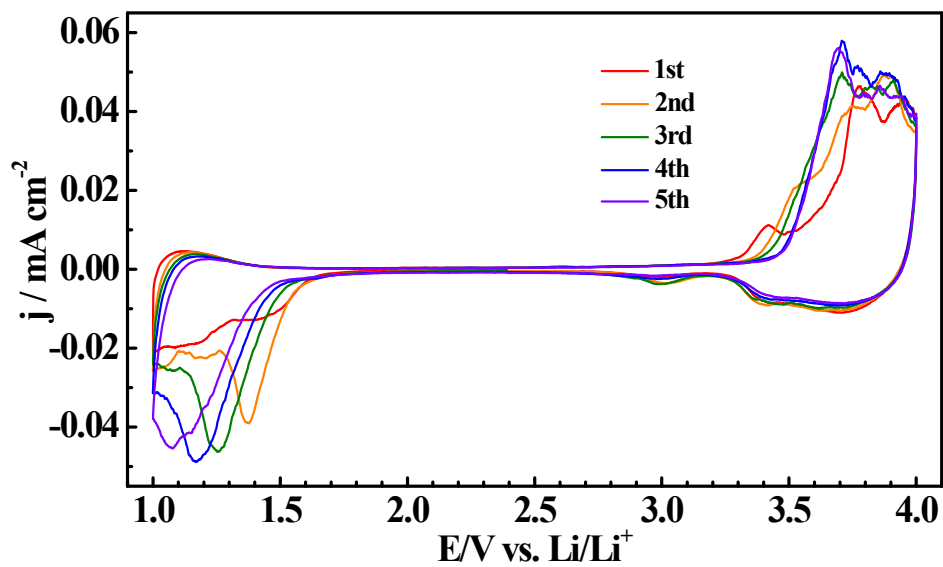

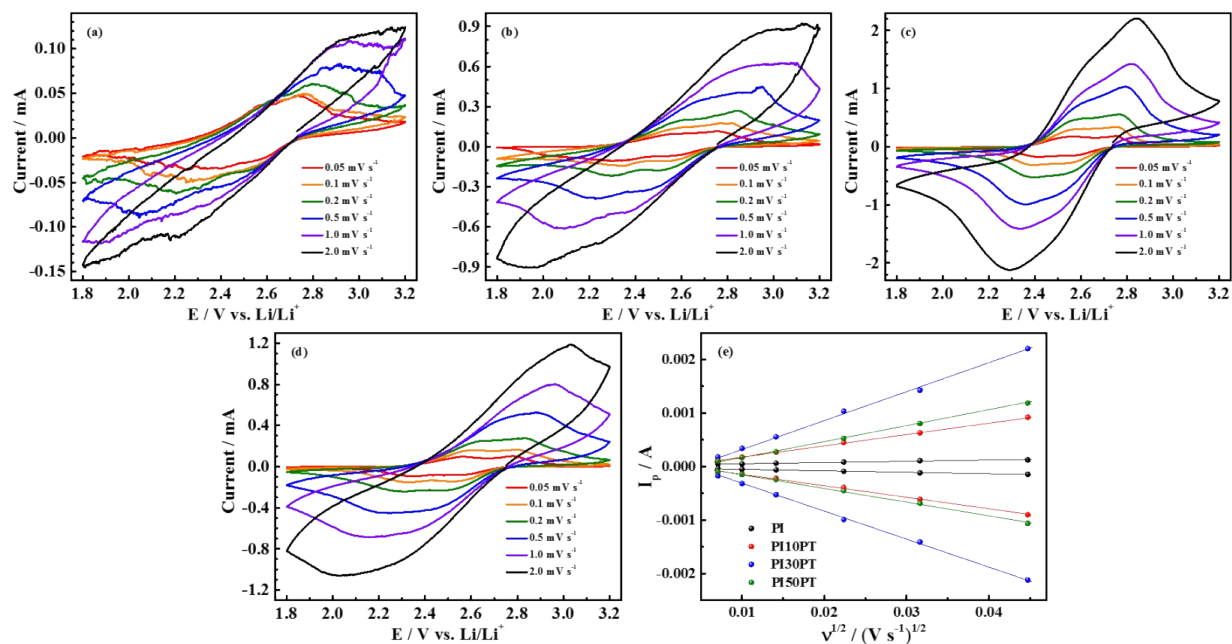**Fig. S2.** CV profiles of the first five cycles for pure PT at a scan rate of 0.05 mV s^{-1}.

Fig. S3. CV profiles of (a) PI, (b) PI10PT, (c) PI30PT and (d) PI50PT at various scan rates from 0.05 to 2.0 mV s^{-1}; (e) relationships between the peak current (I_p) and the square root of scan rate ($v^{1/2}$) in oxidation and reduction processes for PI, PI10PT, PI30PT and PI50PT
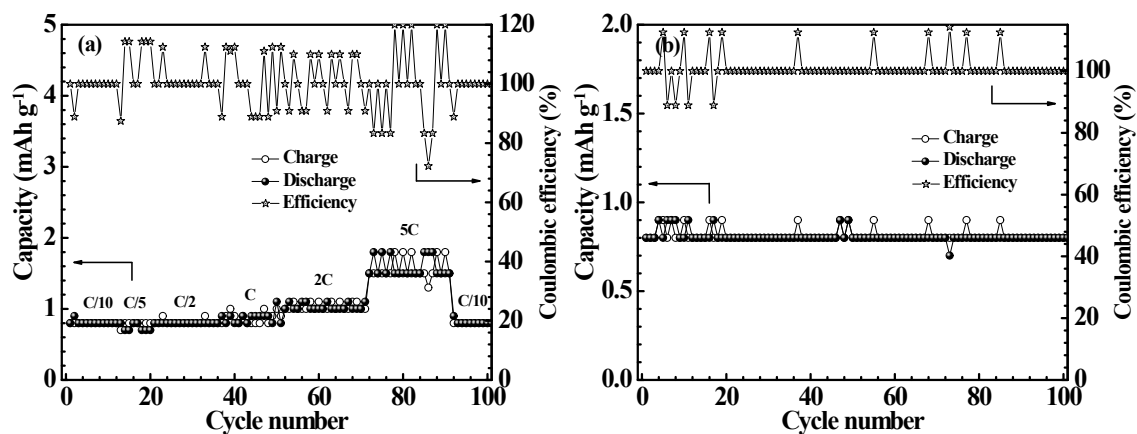

Fig. S4. Charge–discharge capacities and coulombic efficiencies of the half-cells based on pure PT at (a) different rates and (b) a current rate of C/2.

Table. S1. Electrochemical properties of PI composite electrodes

PI composites	Conductive additive and content	Theoretical capacity (mAh g^{-1})	Specific capacity (mAh g^{-1})	High-rate capacity (mAh g^{-1})	Capacity Retention (Cycles and rate)
PI-5[1]	None	405.8	222 at C/20	183 at C/2	>90% (100 at C/2)
PI-FGS-b[2]	11 wt% functionalized graphene sheets (FGSs)	366.8	205 at C/10	~50 at 20C	N/A
PI/CNT[3]	15 wt% carbon nanotube (CNTs)	273	125 at C/10	115 at 2C	93% (300 at C/2.73)
3D-RGO/PI[4]	20 wt% three-dimensional reduced graphene oxide (3D-RGO)	442.7	175 at C/10	>40 at 5C	82% (150 at C/2)
PI/SWNT[5]	~30 wt% single-wall carbon nanotubes (SWNTs)	442.7	226 at C/10	120 at 20C	85% (200 at C/2)
PMTA/SWCNT[6]	35 wt% single-wall carbon nanotubes (SWCNTs)	383	160 at C/10	74 at 10C	87% (200 at C/2)
PMAQ–SWNT[7]	30 wt% single-wall carbon nanotubes (SWNTs)	191	190 at C/10	120 at 20C	91.5% (300 at C/2)
PI-FLEG[8]	10 wt% few layers exfoliated graphene (FLEG)	442.7	177 at C/10	38 at 5C	80% (200 at C/2)
GF-PI[9]	12 wt% 3D reduced graphene oxide (GF)	366.8	240 at C/9.2	100 at 10.9C	81% (600 at C/3.7)
PI30PT (this work)	30 wt% polythiophene (PT)	405.8	217 at C/10	90 at 20C	94% (1000 at 20C)

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