Electronic Supplementary Material (ESI) for Sustainable Energy & Fuels.

Supporting Information for:

Free-standing protective films for enhancing the cyclability of organic batteries

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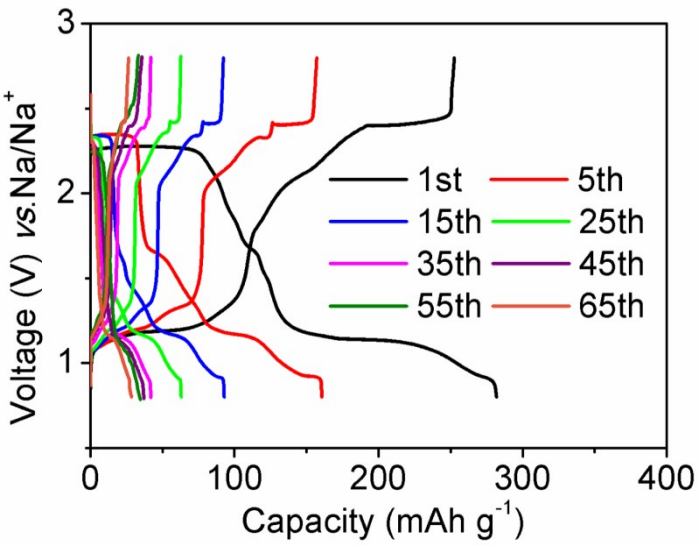

Fig. S1 Voltage profiles of PT electrodes (without protective films) for rate performance (1st, 5th and 65th cycles: 50 mA g^{-1}, 15th cycle: 100 mA g^{-1}, 25th cycle: 200 mA g^{-1}, 35th cycle: 500 mA g^{-1}, 45th cycle: 1000 mA g^{-1}, 55th cycle: 2000 mA g^{-1}).

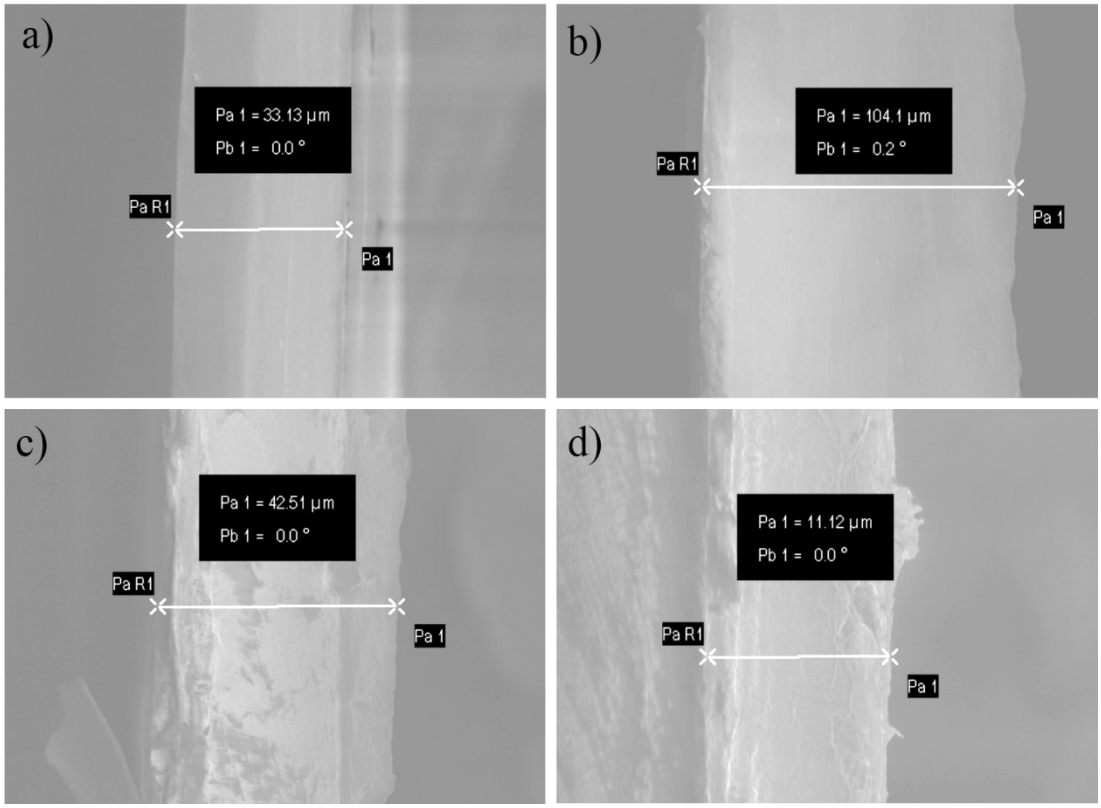

Fig. S2 The SEM images of cross section of the free-standing protective films. a) PEO, b) PPF19, c) PPF37 and d) PPF55.

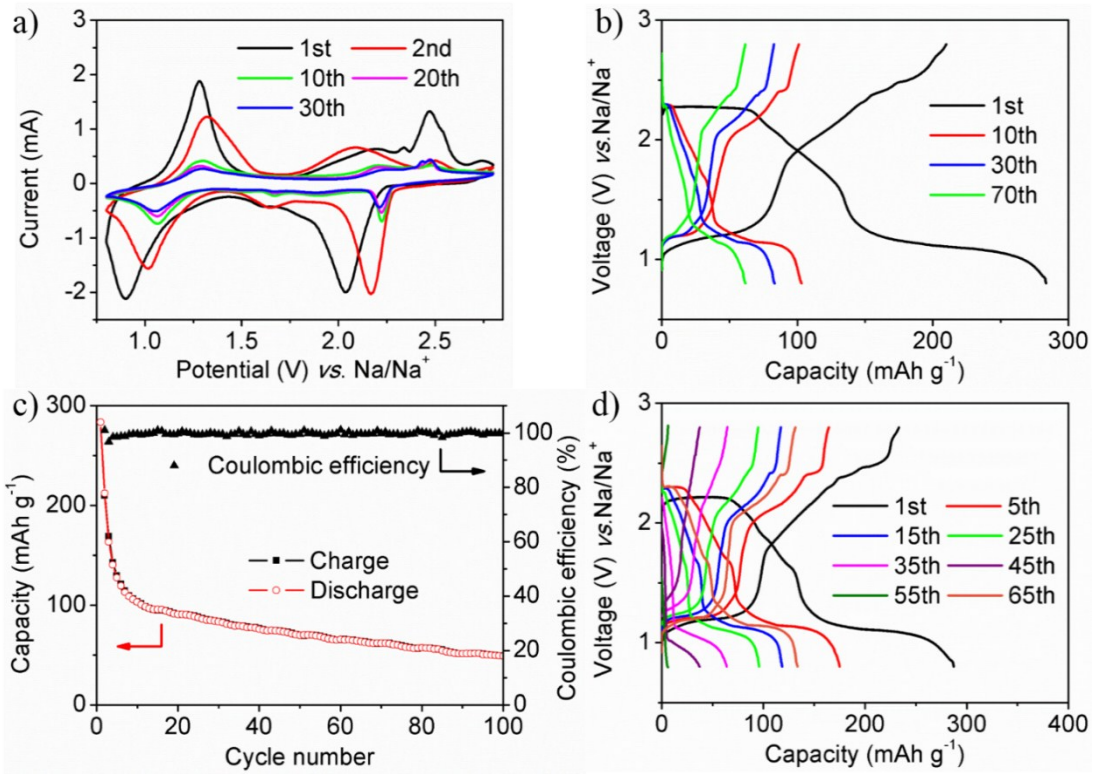

Fig. S3 Electrochemical performances of PT electrodes assembled with PEO. a) CV curves of PT electrodes at the scan rate of 0.5 mV s^{-1}. b) Voltage profiles at the rate of 50 mA g^{-1} (the 1st, 10th, 30th and 70th cycles as representatives). c) Cycling performance at the rate of 50 mA g^{-1}. d) Voltage profiles for rate performance (1st, 5th and 65th cycles: 50 mA g^{-1}, 15th cycle: 100 mA g^{-1}, 25th cycle: 200 mA g^{-1}, 35th cycle: 500 mA g^{-1}, 45th cycle: 1000 mA g^{-1}, 55th cycle: 2000 mA g^{-1}).

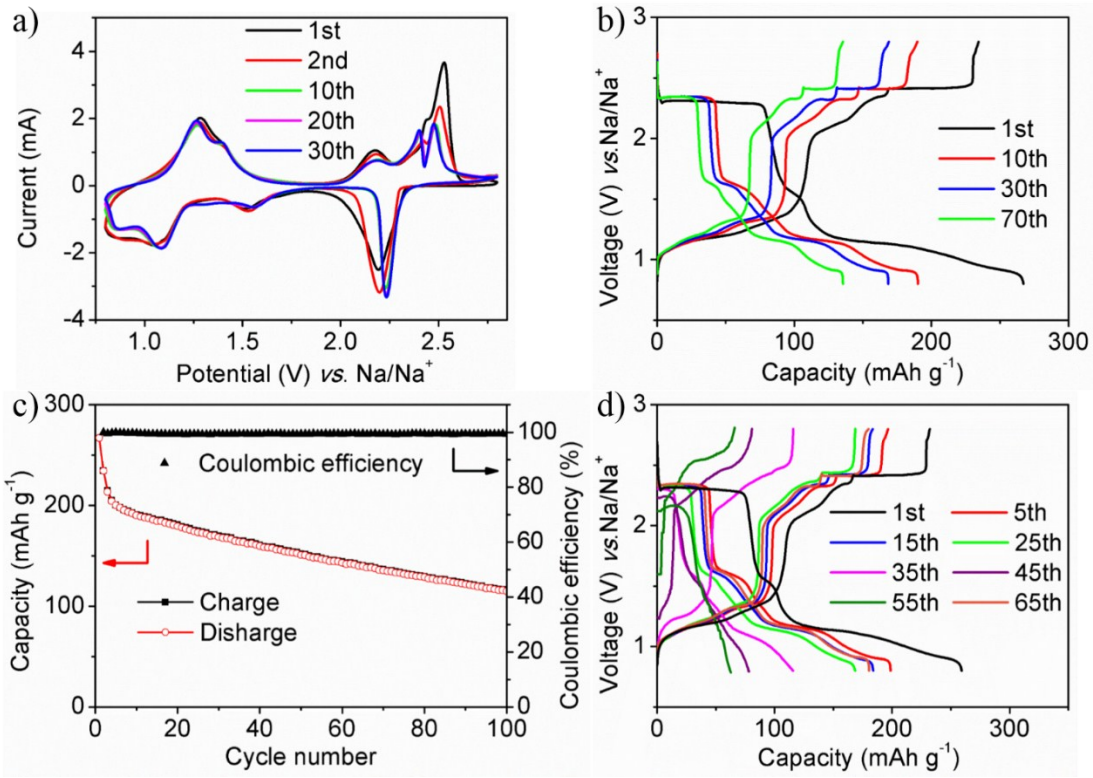

Fig. S4 Electrochemical performances of PT electrodes assembled with PPF19 films. a) CV curves of PT electrodes at the scan rate of 0.5 mV s^{-1}. b) Voltage profiles at the rate of 50 mA g^{-1} (the 1st, 10th, 30th and 70th cycles as representatives). c) Cycling performance at the rate of 50 mA g^{-1}. d) Voltage profiles for rate performance (1st, 5th and 65th cycles: 50 mA g^{-1}, 15th cycle: 100 mA g^{-1}, 25th cycle: 200 mA g^{-1}, 35th cycle: 500 mA g^{-1}, 45th cycle: 1000 mA g^{-1}, 55th cycle: 2000 mA g^{-1}).

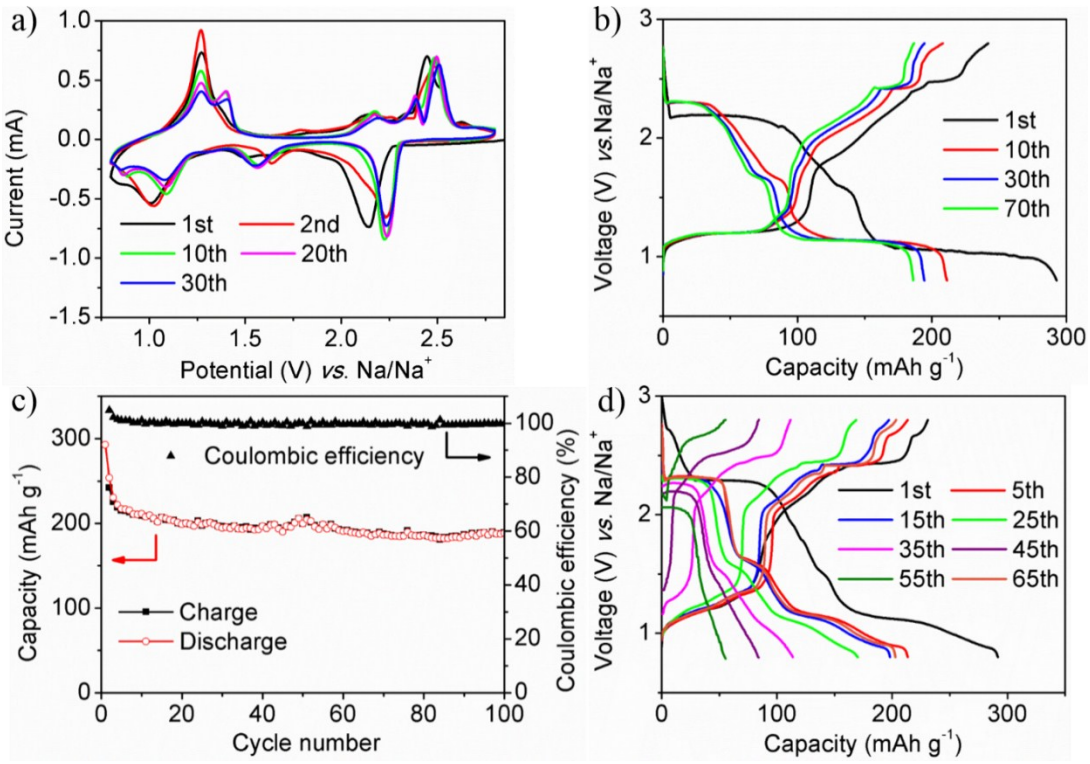

Fig. S5 Electrochemical performances of PT electrodes assembled with PPF37 films. a) CV curves of PT electrodes at the scan rate of 0.5 mV s^{-1}. b) Voltage profiles at the rate of 50 mA g^{-1} (the 1st, 10th, 30th and 70th cycles as representatives). c) Cycling performance at the rate of 50 mA g^{-1}. d) Voltage profiles for rate performance (1st, 5th and 65th cycles: 50 mA g^{-1}, 15th cycle: 100 mA g^{-1}, 25th cycle: 200 mA g^{-1}, 35th cycle: 500 mA g^{-1}, 45th cycle: 1000 mA g^{-1}, 55th cycle: 2000 mA g^{-1}).

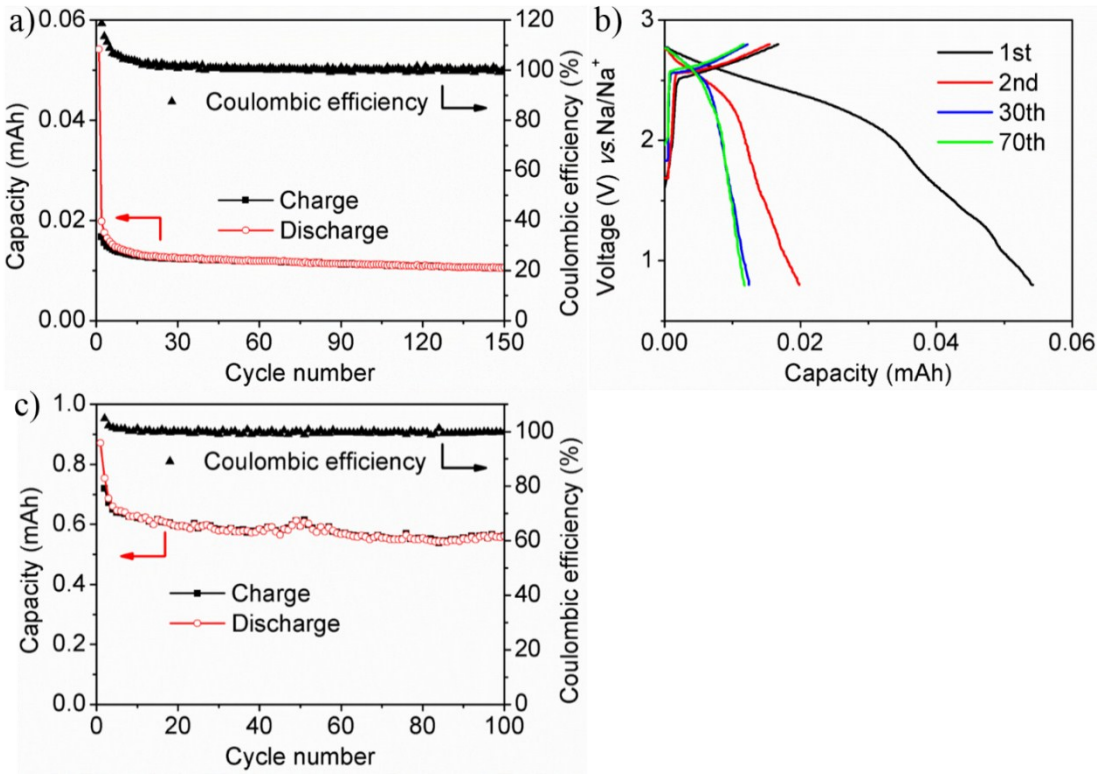

Fig. S6 a) Cycling performance of PPF37 film (assembled without PT cathodes, only current collector was assembled in the cells) at a current of 150 μA from 0.8 V to 2.8 V. The current density is similar to the current density used for PT experiments. b) Voltage profiles of PPF37 film at the current of 150 μA (the 1st, 2nd, 30th and 70th cycles as representative). c) Cycling performance of PPF37 film (assembled with PT) at the rate of 50 mA g^{-1} from 0.8 V to 2.8 V (~150 μA, the quality of PT in each electrode is about 3 mg). The capacity contribution from the PPF thin films (<2%) is negligible in the cells.

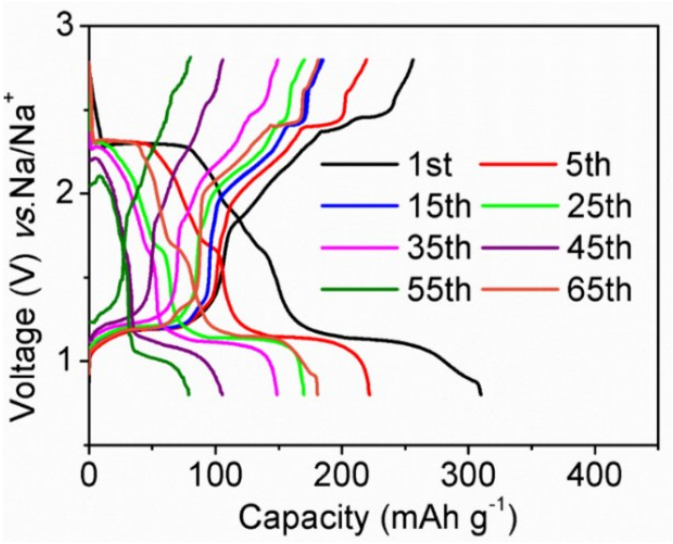

Fig. S7 Voltage profiles of PT electrodes (assembled with PPF55 films) for rate performance (1^{st}, 5^{th} and 65^{th} cycles: 50 mA g^{-1}, 15^{th} cycle: 100 mA g^{-1}, 25^{th} cycle: 200 mA g^{-1}, 35^{th} cycle: 500 mA g^{-1}, 45^{th} cycle: 1000 mA g^{-1}, 55^{th} cycle: 2000 mA g^{-1}).