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Abstract

All-organic rechargeable battery, a promising energy storage technology, has attracted more attention duo to eco-friendliness and sustainable. Especially, the versatile synthetic chemistry of organic electrode provides an opportunity to adjust the electrochemical performance. Recently, a large number of organic materials (including organic molecules and polymers) have been reported to be used as cathodes or anodes for all-organic rechargeable battery, unfortunately, most of them cannot provide redox capability when used in pairs owing to lacking of electrochemically compatible. Therefore, in order to obtain better battery performance, the development of organic anode and cathode materials which can be used in pairs with wide redox potential difference is the top priority of all-organic rechargeable battery research. Herein, an all-organic rechargeable battery based on p-type radical polymer polytriphenylamine-nitrogen oxygen radical (PTPA-PO) cathode and n-type - poly (1,5-anthraquinone) (P15AQ) anode is reported. Since the PTPA-PO and P15AQ operate at a quite high potential of 3.8 V and at a lower potential of 2.1 V (vs. Li+/Li), this all-organic rechargeable battery can output a discharge voltage of ~1.5 V. During the charge/discharge reactions, the electrolyte anions are doping/dedoping at the PTPA-PO cathode simultaneously with the association/disassociation of Li ions at the P15AQ anode. This all-organic battery rechargeable possess an initial discharge capacity of 72.8 mA h g−1 (70 % material activity) at 20 mA g-1 of current density, and exhibit superior rate capability and cyclability.

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