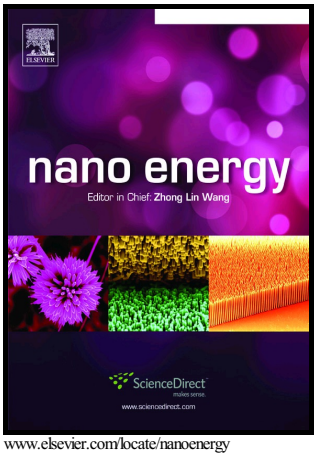

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Cross-conjugated oligomeric quinones for high performance organic batteries

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ABSTRACT

Quinones with their structural diversity and electrochemical reversibility are among the most promising organic electrode materials. One distinct feature of quinones is their cross-conjugated structure, the importance of which in the design of organic electrode materials is so far overlooked. Here we report the design, synthesis, and characterizations of two cross-conjugated quinone oligomers (PBDTD and PBDTDS) and their nanocomposites with carbon nanotubes as potential low-cost organic electrode materials for Li-ion batteries. We investigate the effect of conjugation structure and molecular conformations (planar vs. helical) on electrochemical properties such as electronic conductivity, ionic conductivity, and electrode kinetics. Both quinones deliver similar specific capacity over 200 mAh g^{-1} at 2.5 V versus Li/Li^+ with excellent stability over 250 cycles. In particular, the difference in their rate performance is mainly determined by two aspects. First, cross-conjugation of PBDTD