

Kinetics of conducting polymers with side chain quinone units

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Quinones have been suggested as active material in organic lithium ion battery (LIB) cathodes. They are expected to have higher specific capacities and to be cheaper and more environmentally friendly than the inorganic lithium intercalation compounds used in LIBs today. However, quinone compounds suggested for this purpose often suffer from slow kinetics and low cyclability due to dissolution. In this work, conducting polymers containing pending quinone moieties were synthesized. Immobilizing the redox active quinone units on a conducting polymer matrix decreases both resistance and solubility, which improves the speed and the cyclability of the system, while maintaining a high specific capacity. The two-electron redox reaction of the quinone units in these polymers yields a theoretical capacity of ~300 mAh/g. The polymers were studied electrochemically and spectroscopically to elucidate the kinetics of the polymer charging and the redox cycling of the quinone units.