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Development of Electronically Conductive Polymer Binders for Anode Materials in Lithium Ion Batteries

Sang-Jae Park and Gao Liu*
Environmental Energy Technology Division, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA

Though polymer binders are not active materials, they play an important role in the cohesion of active anode or cathode materials and the adhesion between them and current collectors to improve the capacity and cyclic performance of lithium ion batteries. Especially, for some anode materials (eg. silicon and tin based alloys) showing large volume change during repetitive cycles of lithiation and delithiation, the development of new polymer binders is highly essential to retain the electrical contact and minimize the damage in the electrode. Our group showed that the electronically conductive binders would be used to fabricate the anodes consisting of silicon nanoparticles with high capacity and good cyclability.[1] However, the cost of polymer synthesis would be very expensive due to the use of the precious metal based catalysts and highly inert reaction conditions. In addition, the polymers have very rigid backbone structures and limited solubility and processibility. This study presents the development of new electronically conductive polymer binders with cost-effective synthetic method, flexible backbone structures, and better processibility. Furthermore, the functional groups could be so easily incorporated into the polymer structures that they would tailor the polymer properties and then be well applied to various anode materials with different properties, including silicon nanoparticles and graphite.

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Reference

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