Thesis Proposal

Pyrolysed electrodes for energy storage devices

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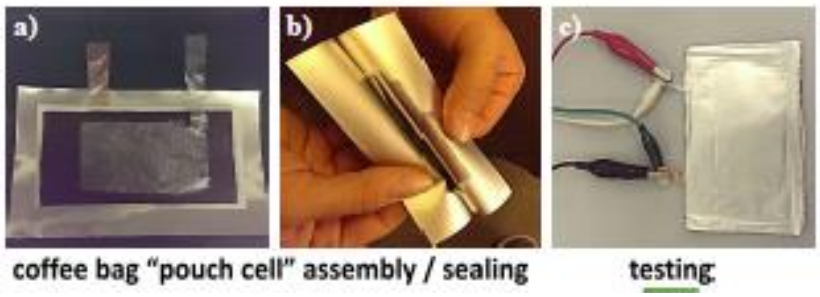

A novel, unique truly solid Li-ion cell structural design, can be fabricated by exploiting carbonized cellulose nanofibers as both conductive binder and current collector substrate. Moreover, cellulose derived nanofibers can be used as reinforcing additive for the preparation of the unconventional composite polymer electrolyte separators. The procedure is simple, easily scalable, and optimized by spray coating and water-based papermaking. The novel electrode design can ensure an intimate contact between the active material particles, concurrently providing remarkable electronic conductivity for both mass and charge transfer. Both carbonised nanocellulose-binded graphite-based and $LiFePO_4$-based electrodes can be exploited, which can deliver high specific capacity near their targeted theoretical value and excellent cycling stability even at high current regimes. They can indeed demonstrate definitely higher electrochemical performance when compared to their not pyrolysed counterparts. As a result, all the components can be fully recovered at the end of the cell operational life by taking advantage of simple water-based paper recycling techniques, opening new horizon for the manufacture of sustainable energy storage devices.