

## Paper-Based Lithium-Ion Battery

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Lithium-ion batteries have a wide range of applications including present day portable consumer electronics and large-scale energy storage. Realization of these batteries in flexible, light-weight forms will further expand the usage in current and future innovative electronic devices. Lithium titanium oxide ( $\text{Li}_4\text{Ti}_5\text{O}_{12}$ ), lithium magnesium oxide ( $\text{LiMn}_2\text{O}_4$ ) and lithium cobalt oxide ( $\text{LiCoO}_2$ ) materials have been consistently studied for application in high capacity batteries, and thus considered in the devices that are presented in the poster. Carbon nanotube (CNT) coated wood microfiber papers are used as current collectors, which provide high surface area, flexibility, and texture of paper, with low CNT utilization ( $10.1\mu\text{g}/\text{cm}^2$ ). The CNT microfiber paper is fabricated by layer-by-layer (LbL) nano-assembly of CNT over cellulose microfibrils. Results from paper-based half-cell batteries show capacities of 130 mAh/g for  $\text{LiMn}_2\text{O}_4$ , 150 mAh/g for  $\text{LiCoO}_2$ , and 158 mAh/g for  $\text{Li}_4\text{Ti}_5\text{O}_{12}$  at C/5 rate. These results are comparable with metallic electrode based cells. The fabrication of CNT microfiber paper, assembly of batteries, experimental methods, and results are presented and discussed.

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