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Weavable High-capacity Electrodes


Nanomaterials have shown enormous potentials in electronics and energy technology innovations. However, processing of nanoscale materials is challenging and often has extremely limited scalability. We designed and synthesized a Si–carbon nanotube (CNT) yarn which is mechanically as strong and flexible as widely used yarns in the textile industry but simultaneously possesses high electrical conductivity. This composite yarn is readily weavable and the process is highly scalable. As an illustration of potential applications, coin-cell lithium ion batteries were fabricated using the yarns as the anode. Because of the high electrical conductivity, the yarn electrode performs without the need of a copper current collector. A Li- storage capacity of 2200 mA h/g was demonstrated, which is five times higher than graphite electrodes and higher compared with previously demonstrated energy yarns based on pseudo capacitor or ultracapacitor materials.