Supporting Information
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Elastic and Wearable Wire-Shaped Lithium-Ion Battery with High Electrochemical Performance**
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Supporting Information

Supporting Videos

Video S1. The wire-shaped battery was used to power five light emission diode under bending.

Video S2. The wire-shaped battery was used to power a light emission diode under stretch with increasing strains.

Experimental Section

The structures were characterized by scanning electron microscopy (Hitachi FE-SEM S-4800 operated at 1 KV), transmission electron microscopy (JEOL JEM-2100F operated at 200 KV) and X-ray diffraction (Bruker AXS D8). The electrochemical performances were measured by an Arbin electrochemical station (MSTAT-5V/10mA/16Ch). The mechanical measurements of the stretchable battery were performed at HY-0350, Shanghai Hengyi Testing Instruments Co. LTD.
**Figure S1.** Structures of the active materials. **a** and **b**, TEM images of LTO and LMO nanoparticles, respectively. **c** and **d**, SEM images of LTO and LMO nanoparticles, respectively.

**Figure S2.** X-ray diffraction patterns of the LTO (**a**) and LMO (**b**) nanoparticles, respectively.
**Figure S3.** Aligned MWCNT/LTO composite yarn.  

- **a** and **b**, SEM images by side and cross-sectional views, respectively.  
- **c** and **d**, Energy-dispersive X-ray spectroscopy images by side and cross-sectional views, respectively. Here titanium is marked with orange.

**Figure S4.** Aligned MWCNT/LMO composite yarn.  

- **a** and **b**, SEM images by side and cross-sectional views, respectively.  
- **c** and **d**, Energy-dispersive X-ray spectroscopy images by side and cross-sectional views, respectively. Here manganese is marked with red.
**Figure S5.** a and b, SEM images of the knotted fiber-shaped MWCNT/LTO and MWCNT/LMO composite yarns, respectively.

**Figure S6.** A half-cell based on the aligned MWCNT/LTO composite yarn electrode without graphene oxide versus lithium wire. The charge-discharge processes were performed at a current of 0.05 mA for 200 cycles.

**Figure S7.** Charge and discharge profiles of a half-cell based on the aligned MWCNT/LTO composite yarn electrode (length of 1 cm) versus lithium wire. They were obtained at increasing currents from 0.02 and 0.05 to 0.1 mA.
**Figure S8.** SEM image of LMO nanoparticles onto aligned MWCNTs before rolled into the yarn.

**Figure S9.** Electrochemical performances of a half-cell based on the aligned MWCNT/LMO composite yarn electrode (length of 1 cm) versus lithium wire before and after mixture of MWCNT powders. **a,** Charge and discharge profiles at a current of 0.02 mA. **b,** Charge and discharge profiles at a current of 0.1 mA.
Figure S10. Capacity-cycle number curve of the wire-shaped full cell at 0.05 mA.

Figure S11. Structure characterization of the fiber-shaped electrodes after charge-discharge at 0.02 mA for 20 cycles. a and b, SEM images of MWCNT/LTO and MWCNT/LMO composite yarns at low magnifications, respectively. c and d, SEM images of the MWCNT/LTO and MWCNT/LMO composite yarns at high magnifications, respectively.
Figure S12. Electrochemical performances of a full cell at 0.1 mA. **a**, Charge and discharge profiles of a full cell (length of 1 cm) fabricated from the MWCNT/LTO and MWCNT/LMO composite yarn electrodes at the first cycle at a current of 0.1 mA. **b**, Characterization on the stability of the full cell at a current of 0.1 mA for 100 cycles.

Figure S13. Photograph of a cycled battery ring to light up a light emission diode.
**Figure S14.** Schematic illustration to the fabrication of the super-stretchy lithium ion battery based on the aligned MWCNT/LTO and MWCNT/LMO composite yarns as the anode and cathode, respectively.

**Figure S15.** Photographs of the super-stretchy wire-shaped battery being deformed into various morphologies.
Figure S16. a. Charge and discharge profiles of the stretchable wire-shaped battery with increasing strains from 0%, 20%, 40%, 60%, 80% to 100% at a current density of 0.01 mA/cm. b. Long-life capacity retention of the stretchable wire-shaped battery at a stretched state with strain of 100% at 0.05 mA.

Figure S17. a, Photograph of a battery being stretched with the strain of 100%. b, and c, SEM images of an MWCNT/LTO cathode and an MWCNT/LMO anode after stretching at a, respectively.
Figure S18. **a** and **b**, Resistance changes of the cathode and anode during the stretching and releasing process at a strain of 100%, respectively.

Figure S19. Stress-strain curve of the packing sheath layer.