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Supplementary Information for:

Rechargeable zinc-air battery using Co$_3$O$_4$ nanoparticle-modified MnO$_2$ nanotubes as air-cathode catalysts

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A home-made zinc-air cell device was designed for the battery test. The air electrode was prepared by spraying the catalyst onto a gas diffusion layer (SGL Carbon paper, Germany, 2 cm × 2 cm) to achieve a loading of 2 mg cm⁻². The electrolyte used in the zinc-air battery was 6 M KOH, and a polished zinc plate was used as the anode.

**Fig. S1.** The photo of the home-made zinc-air cell device.
Fig. S2. XPS spectrum of MnO$_2$/Co$_3$O$_4$ hybrid nanomaterials.

X-ray photoelectron spectroscopy (XPS) was utilized to probe the Mn, Co, O and C elements of the hybrid nanomaterials.
Fig. S3. Power densities of the zinc-air battery using MnO$_2$ nanotubes and MnO$_2$/Co$_3$O$_4$ hybrid nanomaterials as bifunctional air cathode catalysts.

The maximum power density of the MnO$_2$ nanotubes and MnO$_2$/Co$_3$O$_4$ hybrid nanomaterials is 36 and 33 mW/cm$^2$ at 25 °C, respectively.