Supporting Information for

High surface area ZnO-carbon composite tubular arrays based on Kirkendall effect and in-situ Zn evaporation

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Experimental section. Hydrothermal treatment: Firstly, 2.23g Zn(NO\textsubscript{3})\textsubscript{2} and 0.8g glucose were mixed with 180 mL of distilled water in a beaker with vigorous magnetic stirring at room temperature for 30 min to obtain a homogeneous solution, then 6g ammonia(28%) was added. A piece of polycrystalline ceramic substrate (purity >99.5%, from Shanghai Chemical Reagent Co., Ltd.), cleaned with acetone and deionized (DI) water in an ultrasonic cleaner and dried in air at 50 °C, was vertically immersed into the above reaction solution. At last, the beaker was sealed and heated at 95°C for 24 hours, with slight stirring maintained for the entire heating process. After the reaction, the substrate covered tightly with carbonaceous species-coated ZnO structures was rinsed with ethanol and dried in air for further characterization.

Characterization. The product was firstly examined using a Bruker D8 advance X-ray diffractometer (XRD, Cu K\textsubscript{α} radiation; \(\lambda=1.5418 \text{ Å}\)), then observed by scanning electron microscopy (SEM, JSM-6700F;5kV) and transmission electron microscopy (TEM and HRTEM, JEM-2010FEF; 200 kV) equipped with EELS. Thermogravimentric (TG) and differential analyse (DTA) were carried out with an STA 449C thermal analyzer at a
10°C/min heating rate in air atmosphere to analyze the mass ratio of the ZnO-carbon composite. Specific surface area was measured on BEL SORP-mini (S/N-00230) nitrogen adsorption equipment at liquid nitrogen temperature. Jobin-Yvon LabRam Infinity Raman spectroscopy with a 514.5 nm Ar⁺ laser excitation was used to analyze the phase composition of the ZnO-carbon composite tubes.

**Fig. S1 HRTEM image of the selected shown in Fig. 2b**
Fig. S2 Nitrogen adsorption/desorption isotherm and Barrett-Joyner-Halenda (BJH) pore size distribution plot (inset) of the ZnO-carbon composite tubes.
Fig. S3 Raman spectrum of the ZnO-carbon tubular composite.
Fig. S4 TG and DTA curves of the ZnO-carbon composite array.