

ESI:

Carbon nanocoating: an effective nanoreactor towards well-defined carbon-coated GaN hollow nanospindles

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Experimental section

Synthesis of C-GaOOH nanospindles.

In a typical synthesis procedure, 0.1 g of gallium chloride and 0.2 g of glucose were dissolved in 10 mL of distilled water forming a clear solution, and 10 mL of NaHCO₃ aqueous solution (0.6 mM) was then added dropwise to the solution under stirring. Subsequently, the mixture was transferred into a 20 mL Teflon-lined stainless steel sealed autoclave, and heated to 180⁰C and maintained for 10 h. When the autoclave was cooled to room temperature naturally, the brown precipitate was collected and then washed with distilled water and absolute alcohol several times to remove residual ions and possible remnants. The final product was dried in vacuum at 60⁰C for 2 h. Pure GaOOH nanospindles were obtained with the same experimental conditions except the absence of glucose.

Synthesis of C-GaN hollow nanospindles.

The above as-obtained C-GaOOH nanospindles were loaded into a quartz crucible which was placed at the center of a quartz tube. The quartz tube was purged with a pure NH₃ flow at a constant rate of 20 sccm for 20 min to remove oxygen and moisture. Then, the system was heated to 800⁰C with a rate of 7⁰C min⁻¹ and then maintained for 2 h under the same NH₃ flow. Pure GaN were obtained using GaOOH

nanospindles with the same experimental conditions.

Characterization.

Powder X-ray diffraction (XRD) measurements were carried out with a Philips PW3040/60 X-ray diffractometer using Cu-K α radiation at a scanning rate of 0.06°s⁻¹. Scanning electron microscopy (SEM) was performed with a Hitachi S-4800 scanning electron microanalyzer with an accelerating voltage of 15 kV. Transmission electron microscopy (TEM) and high-resolution transmission electron microscopy (HRTEM) were conducted at 200 kV with a JEM-2100F field emission TEM. And Raman spectroscopy was performed a confocal Raman Witec alpha 300 SR with a excitation laser at 488 nm. Photoluminescence spectrum was recorded with a FLS-920 fluorescence spectrophotometer.

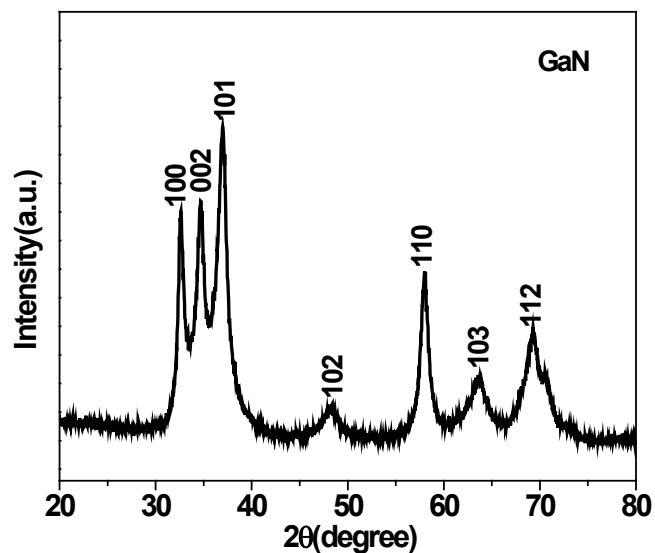


Fig. S1 XRD pattern of the as-prepared pure GaN.

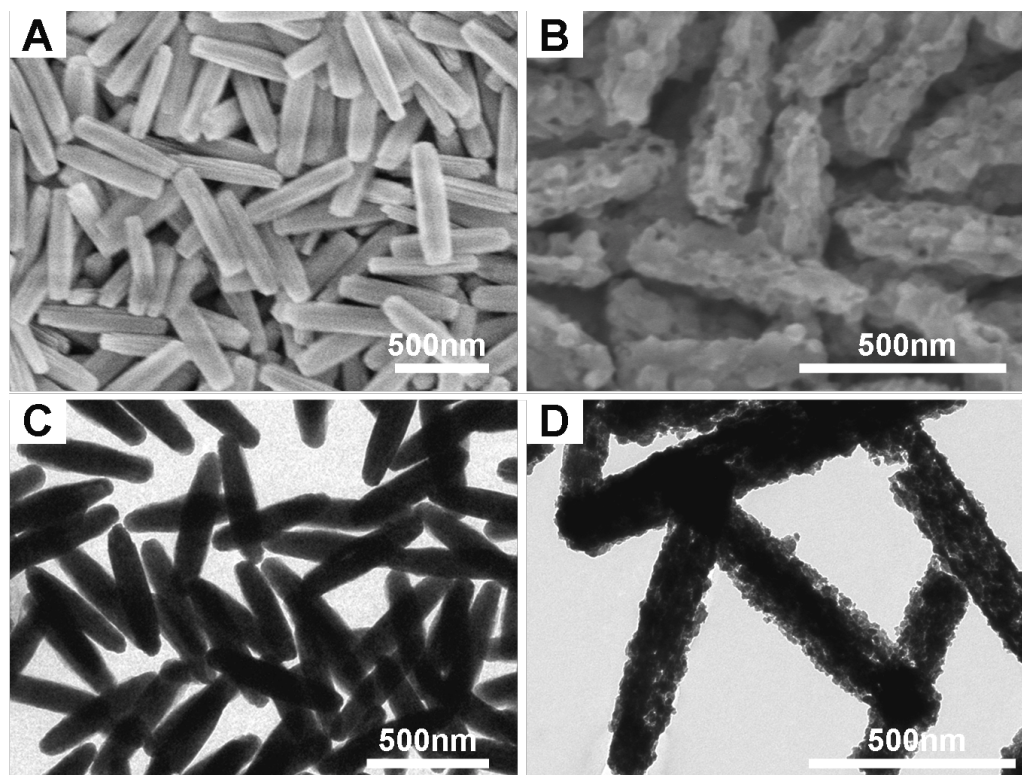


Fig. S2 SEM images of the as-prepared pure GaOOH nanospindles (A) and GaN (B), and TEM images of the pure GaOOH nanospindles (C) and GaN (D).

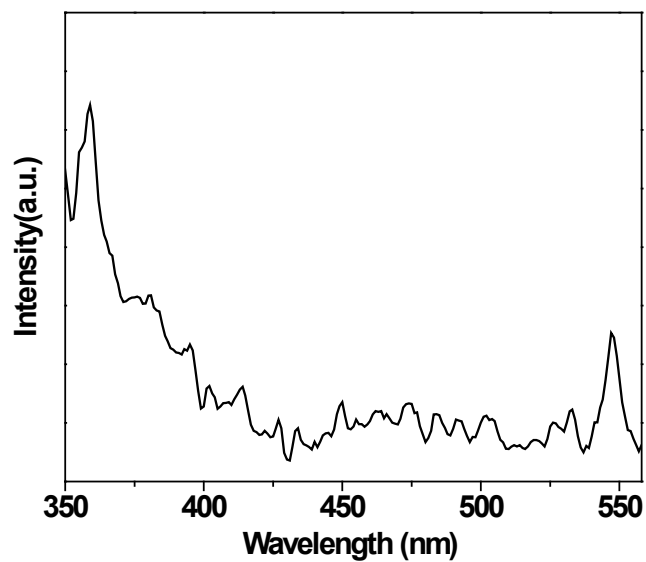


Fig. S3 The photoluminescence spectrum of the as-prepared C-GaN hollow nanospindles.