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ZnO nanorods on reduced graphene sheets with excellent field emission, gas sensor and photocatalytic properties

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I . The reduced graphene sheets' preparation

0.01 g of graphite oxide sheets were ultrasonically dispersed into 10 mL of absolute ethanol in a capped bottle, followed by ultrasonic stirring for 1 h to form a homogeneous suspension. The homogeneous suspension was spin-coated on a SiO_2/Si substrate at 1000 rpm over 2 min, and then thermally reduced at 650 °C for 30 min under a 100 sccm H2 gas flow. Figs. S1a and b reveal that the as-grown reduced graphene sheets (rGss) are multi-layered (≤ 8 nm) with a mean area of ~10-300 μm^2.

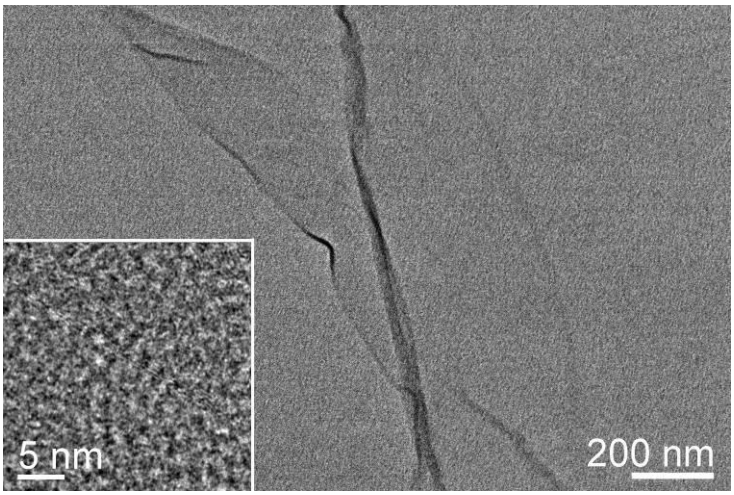

Fig. S1 TEM image shows a rGs; the inset shows that the rGs is multi-layered.

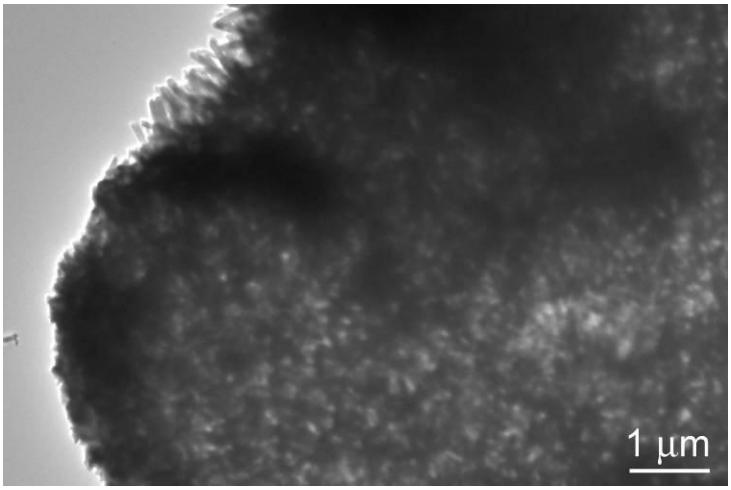

Fig. S2 TEM images show that the ZnO nanorod arrays are assembled on the graphene sheets' surfaces.

II. Synthesis of ZnO Nanorods

The Ni foam substrates were put in a mixed solution consisting of $Zn(NO_3)_2 \cdot 6H_2O$ (0.025 M), hexamethylenetetramine (0.025 M), and 50 mL de-ionized water. After being stirred, the mixture was subjected to a hydrothermal process at 95 °C for 8 h in a 60 mL autoclave. After reactions, the Ni foam substrates were removed from the solution, and the as-obtained product in solution was washed successively with deionized water and ethanol to remove any residual ionic species, and finally dried in vacuum at 60 °C for 12 h. Fig. S3a shows a low-magnification SEM image of the primary ZnO nanorods, which are well controllable, high yield, and high reproducibility. The nanorods have a diameter of 50~80 nm and length of 1~2 μm, with a relative smooth surface, as shown in Fig. S3b.

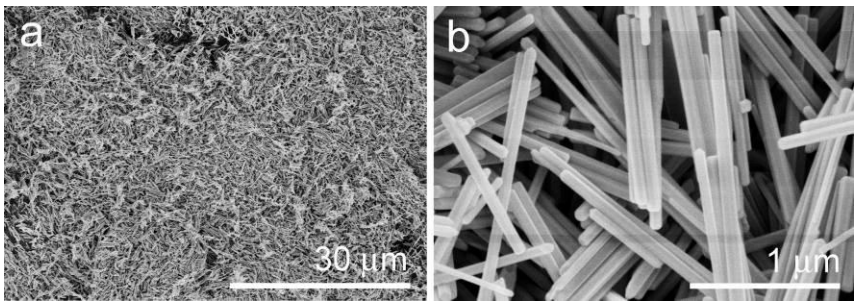

Fig. S3 (a) and (b) SEM image showing the ZnO nanorod.