Supplementary Materials for Nanoscale

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Flexible and transparent graphene-ZnO nanorod hybrid structure fabricated by exfoliating graphite substrate

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1. Diffusion reflectance spectra

Diffusion reflectance spectrum was measured for the ZnO NR/PDMS composite before and after exfoliation process. The results show that the bandgap energy of the ZnO NRs was decreased after exfoliation process. This results support the photoluminescence results as shown in Fig. 3.

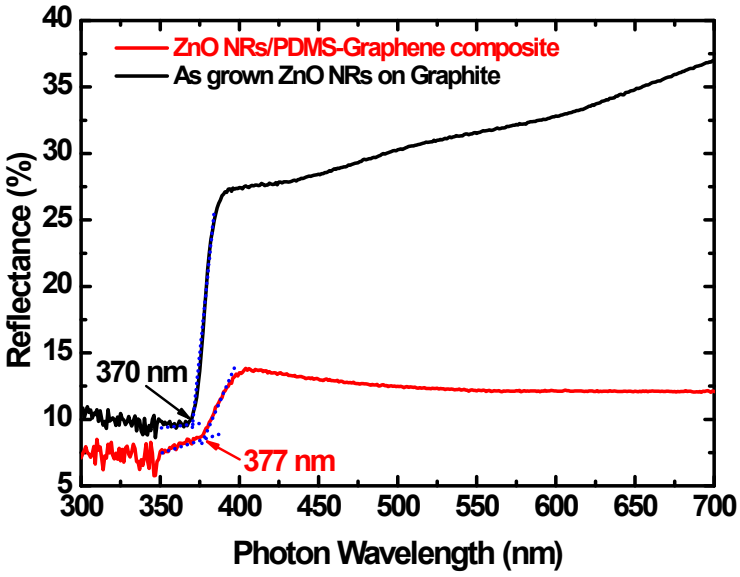

Figure S1. Diffusion reflectance spectra of the as-grown ZnO NRs on graphite substrate and

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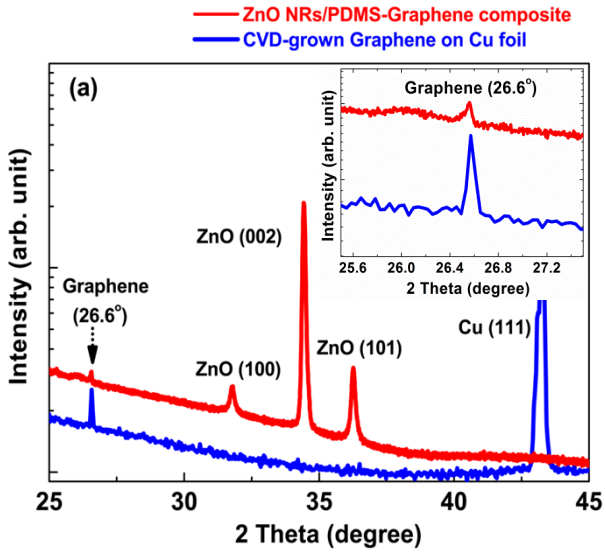
free-standing graphene/ZnO NR composite.

2. X-ray diffraction (XRD) and transmission electron microscope (TEM) results

X-ray diffraction (XRD, PANalytical, MPD for thin film) was measured by using Cu Kα radiation. The XRD result was compared with that of the graphene grown on Cu substrate by chemical vapor deposition (CVD). The peaks at 26.6° for both samples corresponds to the graphene layer. This indicates that the graphene layer exist in the sample after exfoliation process. To prepare the TEM sample, the exfoliated ZnO nanorods/graphene composite was dissolved with 1 M of tetrabutylammonium fluoride in Dimethylformamide solution to remove the embedding polydimethylsiloxane (PDMS) layer for 3 hrs [J. N. Lee et al., *Anal. Chem.* **75** (2003) 6544-6554]. The TEM sample was obtained by dipping the TEM sampling grid into the solution and drying it in the vacuum oven for 1 hr. TEM (Hitachi, HF-3300) operating at 300 kV was used and the chemical composition was measured by energy dispersive X-ray spectroscopy (EDS) attached to the TEM.



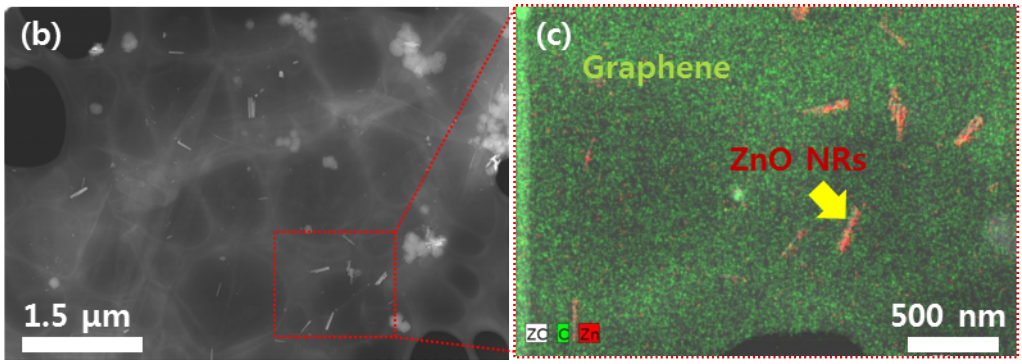


Figure S2. (a) XRD patterns of free-standing graphene/ZnO NR composite and graphene grown on Cu substrate. The inset shows the XRD patterns for the selected range around the peak of graphene. (b) TEM image of graphene/ZnO NR composite (c) EDS mapping of the Zn (red) and C (green) elements for graphene/ZnO NR composite.