Supporting Information

Optical Design of ZnO-based Antireflective Layers for Enhanced GaAs Solar Cell Performance

Hye Jin Lee, Jae Won Lee, Hee Jun Kim, Dae-Han Jung, Ki-Suk Lee, Sang Hyeon Kim, Dae-myeong Geum, Chang Zoo Kim, Won Jun Choi, and Jeong Min Baik

a School of Materials Science and Engineering, KIST-UNIST-Ulsan Center for Convergent Materials, Ulsan National Institute of Science and Technology (UNIST), Ulsan 689-798, Republic of Korea.
b Center for Opto-Electronic Materials and Devices, Korea Institute of Science and Technology, Seoul, 136-791, Korea
c Nano Process Division Korea Advanced Nano Fab Center Gyeonggi-do 443–270, Korea

* Corresponding author

* To whom correspondence should be addressed. E-mail: wjchoi@kist.re.kr, jbaik@unist.ac.kr

Fig. S1 Top view of SEM image for ZnO nanosheet/Al/ZnS with thickness of Al (a) 0.5 nm, (b) 1 nm, (c) 3 nm and (d-f) histogram of the thickness distributions of the nanosheets with Al thickness, respectively.
Fig. S2 Scanning electron micrographs of (a) ZnO nanosheets and (b) ZnO nanowires grown on Si substrates. The corresponding EDXS results are also shown in (c) and (d), respectively.
**Fig. S3** The peak in the Al 2p spectra corresponds to Al-O and Al-Zn-O bonds. The Al-O binding energy was observed at 73.48 eV, lower than that (~75.6 eV) of the pure Al₂O₃.

**Fig. S4** Transmission electron microscopy (TEM) images of MgF₂ thickness on MgF₂/ZnO nanowires (scale bar is 5 nm).

**Fig. S5** Simulated reflectance spectra for the ZnO/TiO₂ and ZnO/ZnS double layered films with...
different thickness. The thickness is ZnO 100nm, TiO$_2$ (or ZnS) (a) 50 nm, (b) 60 nm, (c) 70 nm and (d) 100 nm.