Supplementary Information for

Remote homoepitaxy of ZnO microrods across graphene layers

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Author Contributions

J.J and K-A.M. contributed equally to this work.

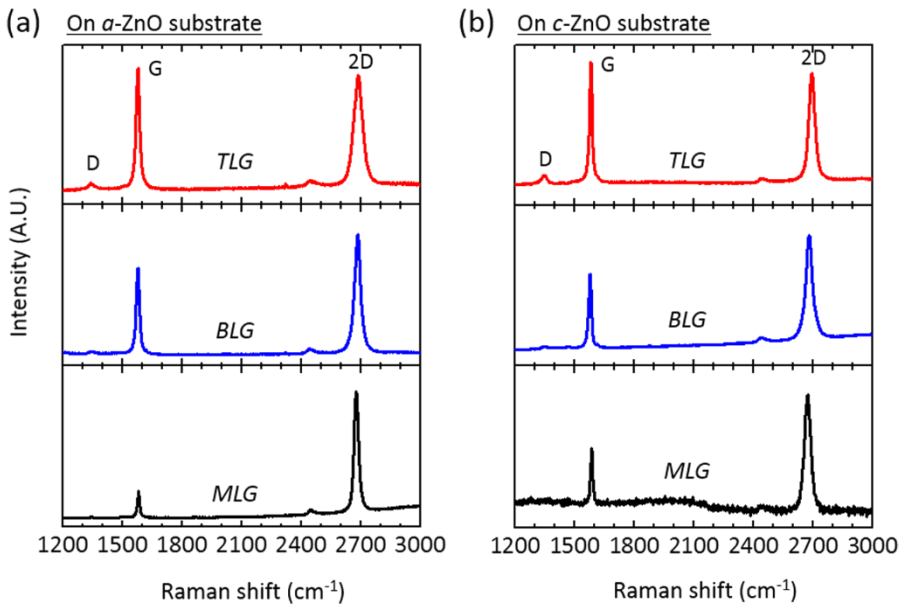

Figure S1. Raman spectra for MLG (bottom), BLG (middle), and TLG (top) layers coated on (a) *a*-ZnO and (b) *c*-ZnO substrates after remote epitaxy of ZnO overlayer.

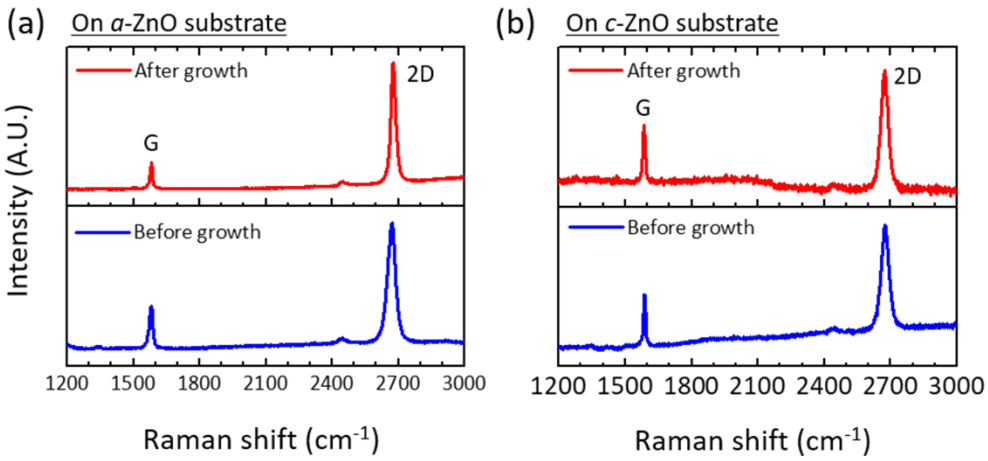

Figure S2. Raman spectra for MLG coated on (a) *a*-ZnO and (b) *c*-ZnO substrates. Bottom blue lines are the spectra obtained before hydrothermal growth of ZnO MRs, and red ones are after hydrothermal growth of ZnO MRs.

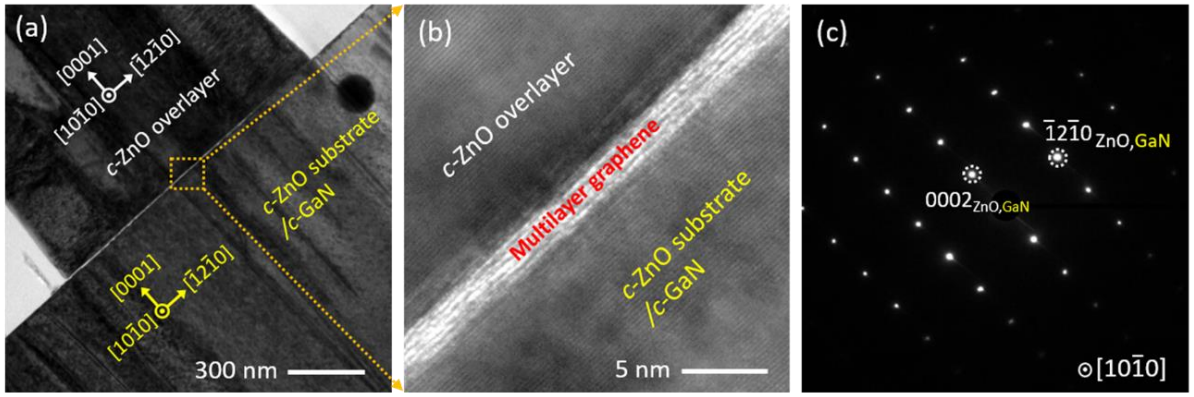

Figure S3. Cross-sectional TEM analyses for remote epitaxial *c*-ZnO/multilayer graphene/*c*-ZnO heterostructure. (a) Low-magnification TEM image and (b) the corresponding HR-TEM image enlarged from boxed area of (a). (c) Electron diffraction patterns of *c*-ZnO MR/graphene/*c*-ZnO substrate.

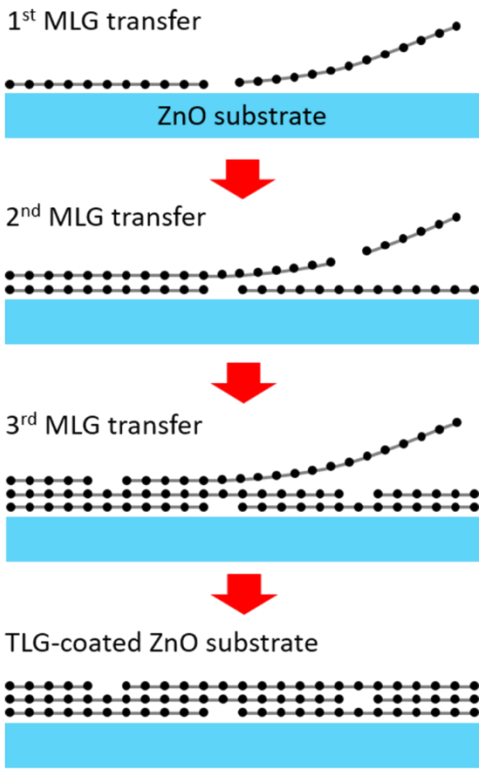

Figure. S4. Schematic illustrations for preparation of graphene-coated ZnO substrate. For BLG and TLG-coated substrates, the transfer of MLG was repeated with respect to the number of graphene layers. This substrate preparation method remarkably reduces the presence of small opening defect of graphene that may induce the homoepitaxial nucleation and growth of ZnO directly via the opening defects.

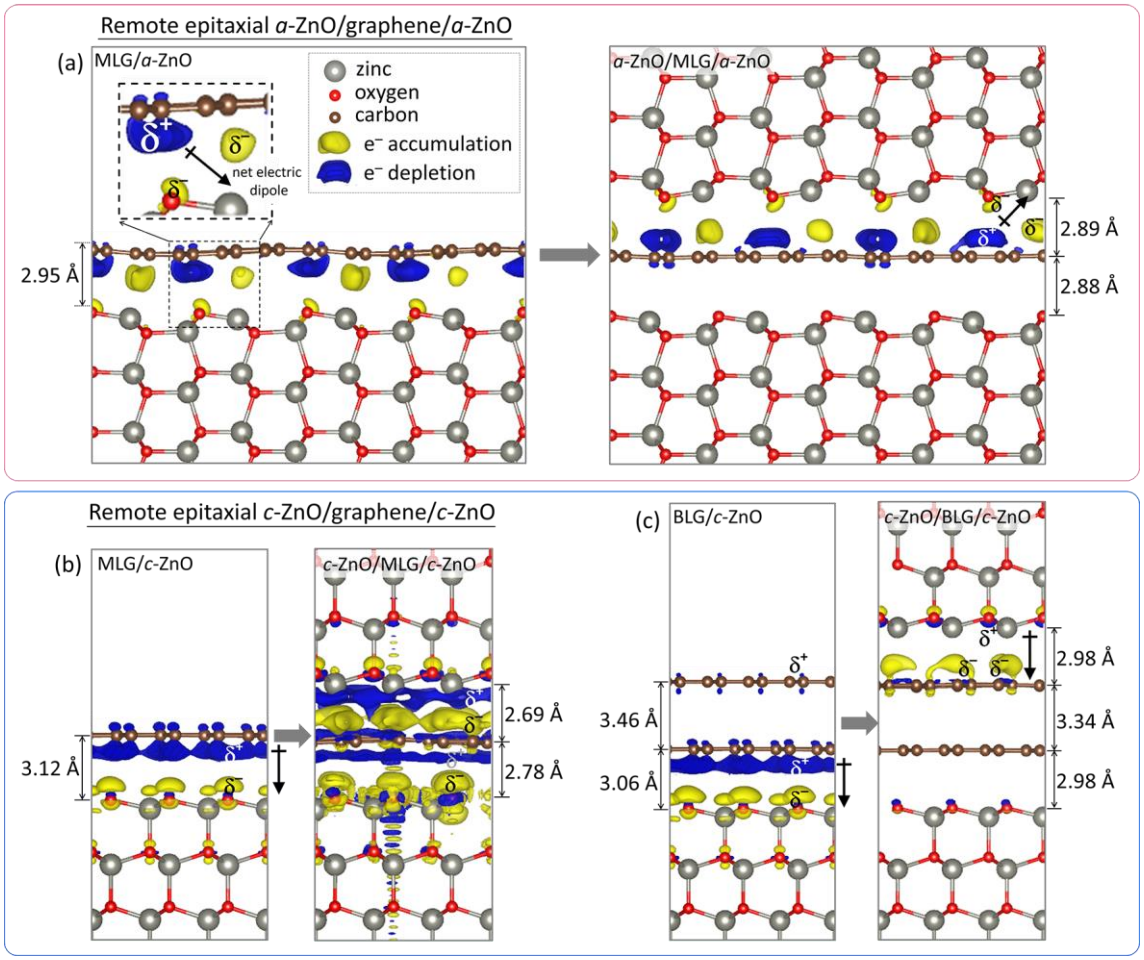

Figure S5. Atomic structure and charge density difference (ΔCD) of remote epitaxial (a) *a*-ZnO/MLG/*a*-ZnO, (b) *c*-ZnO/MLG/*c*-ZnO, and (c) *c*-ZnO/BLG/*c*-ZnO heterointerfaces. All the left panels show stable atomic configuration and ΔCD of substrates before remote epitaxy, while the right panels correspond to those of remote epitaxial heterointerfaces after the overlayer growth. The ΔCDs were depicted at isosurface levels of ±0.001 e/bohr^3. The yellow and blue isosurfaces stand for the electron accumulation and depletion regions, respectively.

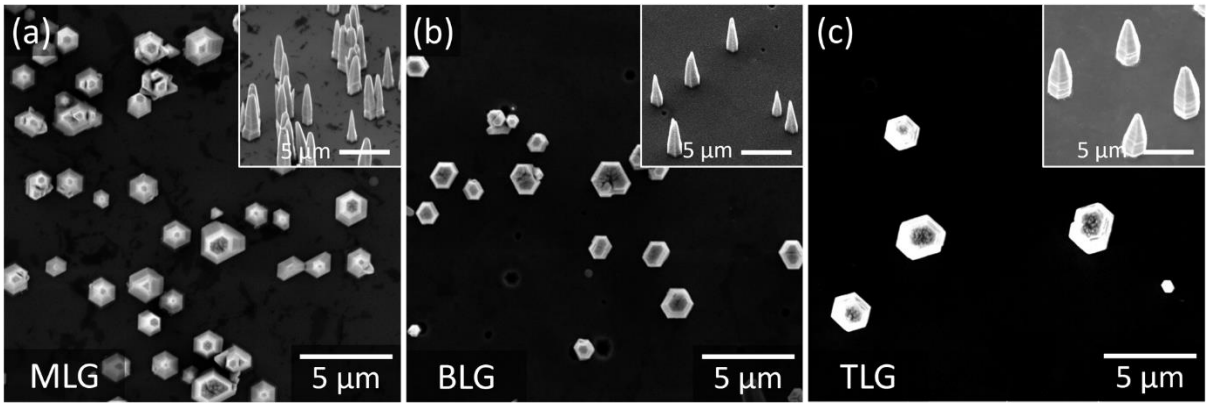

Figure S6. Regeneration of substrate for remote epitaxy of ZnO MRs. Plan-view FE-SEM images of ZnO MR arrays grown on (a) MLG-, (b) BLG-, and (c) TLG-coated *c*-ZnO substrates. Insets are tilt-view FE-SEM images.