

Supporting Information

Direct Growth of Graphene Nanowalls on Silicon Using Plasma-Enhanced Atomic Layer Deposition for High-Performance Si-based Infrared Photodetectors

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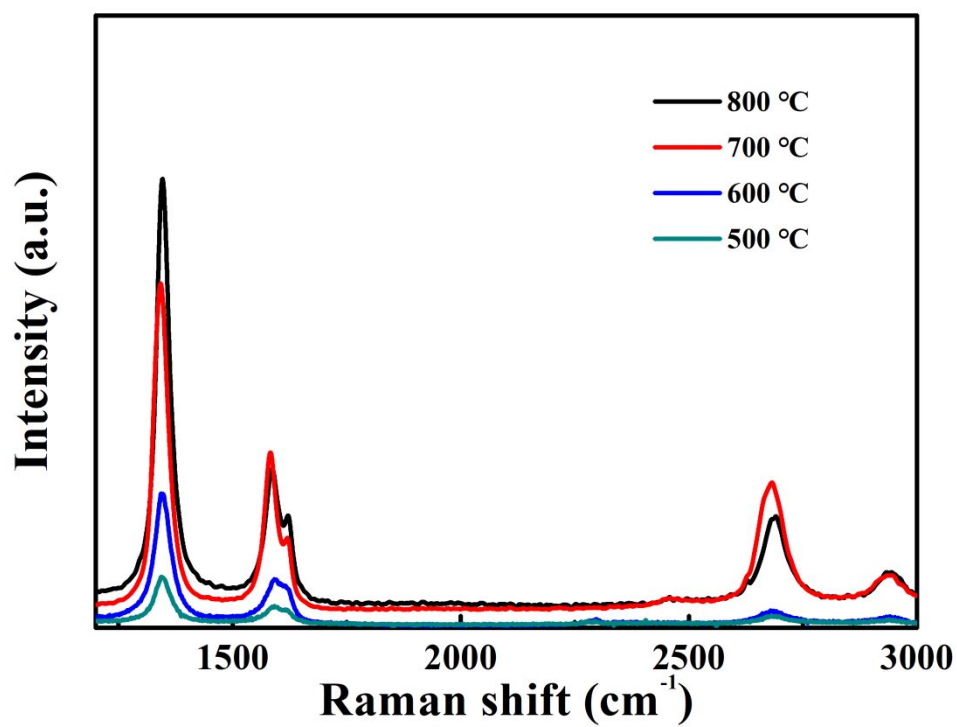


Figure S1. Raman spectra of the PEALD grown graphene samples at different reaction temperatures.

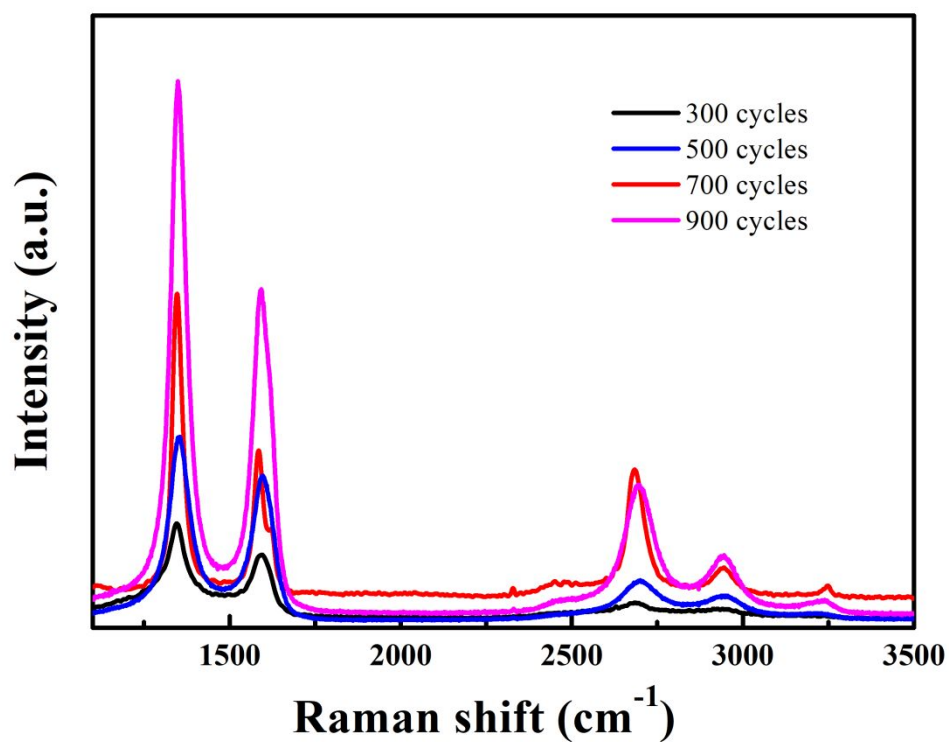


Figure S2. Raman spectra of the PEALD grown graphene samples at different reaction cycles.

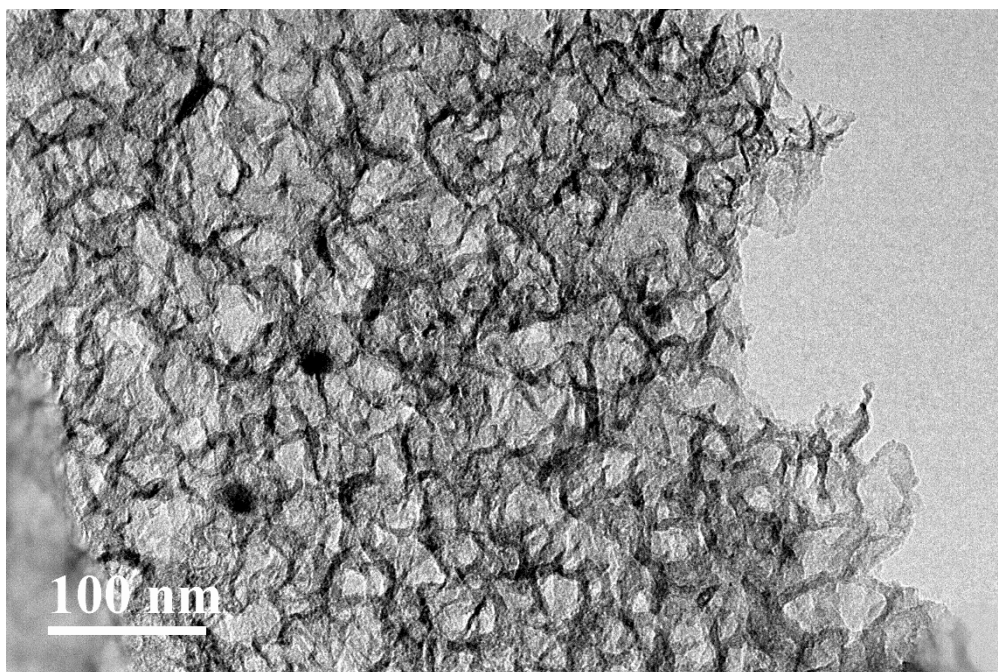


Figure S3. Overall HR-TEM images of the PEALD grown GNWs using dose ratio of benzene to formic acid as 1:2.

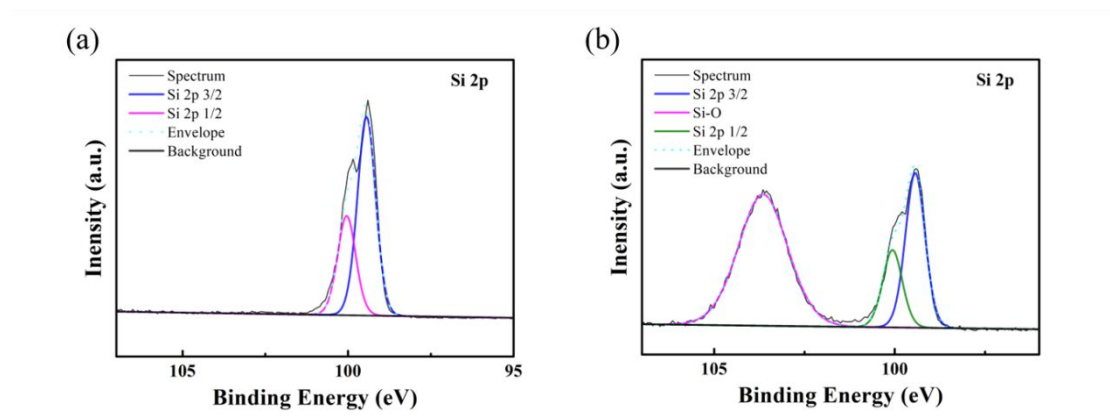


Figure S4. Si 2p XPS spectrum of (a) Si and (b) SiO₂ samples.

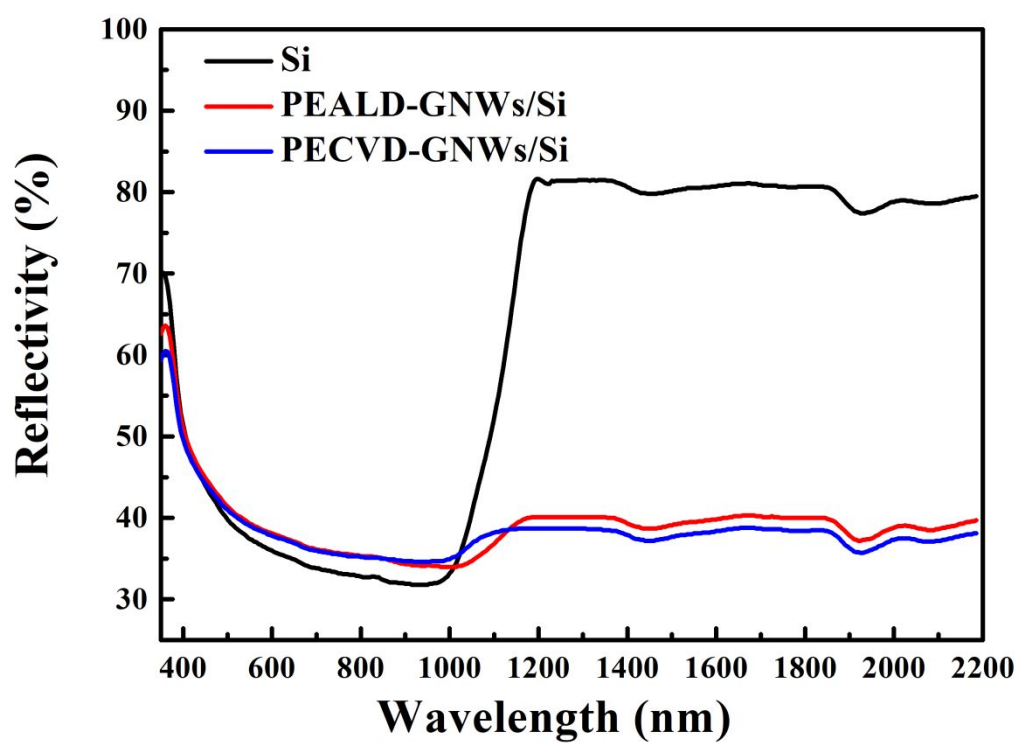


Figure S5. Reflectance spectrum of the single-side polished silicon wafer, PEALD grown GNWs on silicon and PECVD grown GNWs on silicon.

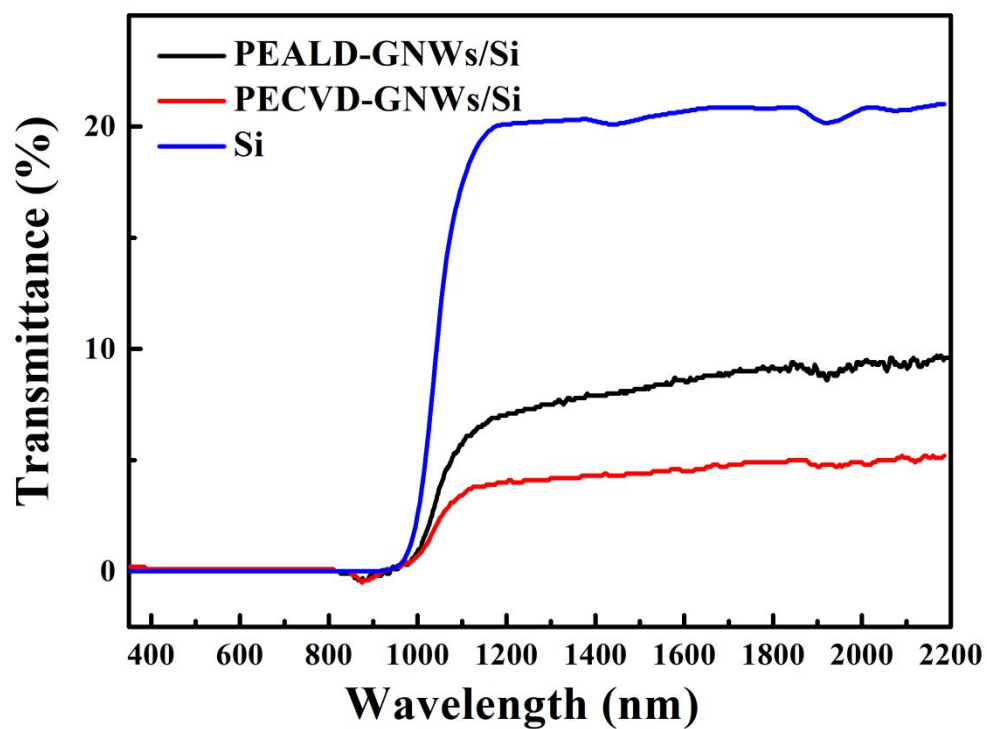


Figure S6. Transmittance spectrum of the single-side polished silicon wafer, PEALD grown GNWs on silicon and PECVD grown GNWs on silicon.

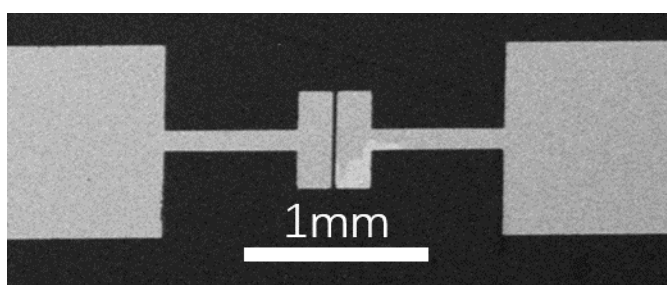


Figure S7. SEM image of I-V test structure. The channel between the electrodes is 25 μm and the width is 500 μm .

Table S1. The responsivity of three samples at different wavelengths.

Responsivity	1850 nm	1342 nm	532 nm
PEALD-GNWs/Si	1.15 $\mu\text{A/W}$	15 mA/W	0.152 A/W
PECVD-GNWs/Si	13.2 $\mu\text{A/W}$	1 mA/W	0.098 A/W
Graphene/Si	/	0.031 mA/W	0.221 A/W

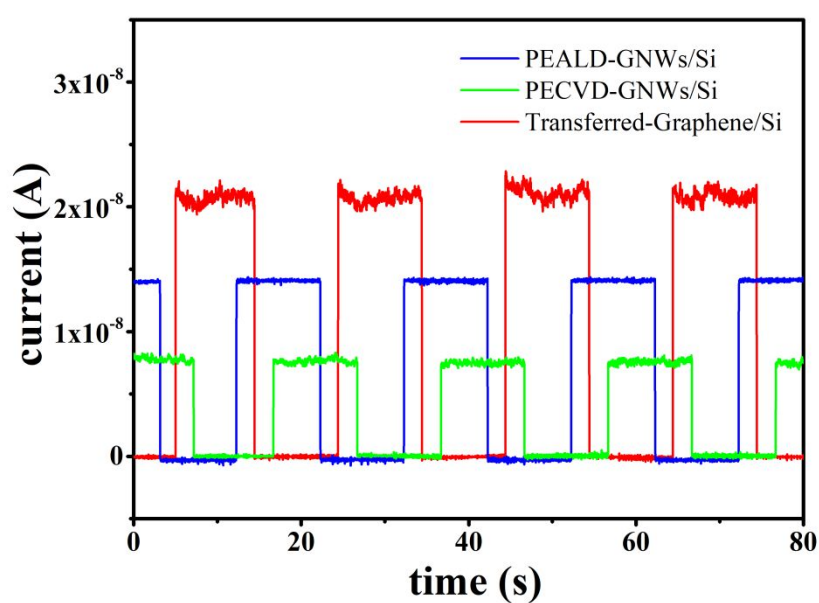


Figure S8. Photo-switching curves of different photodetectors under a pulsed light irradiation of 532 nm. The intensity of the light source was fixed at 1 $\mu\text{W}/\text{cm}^2$.

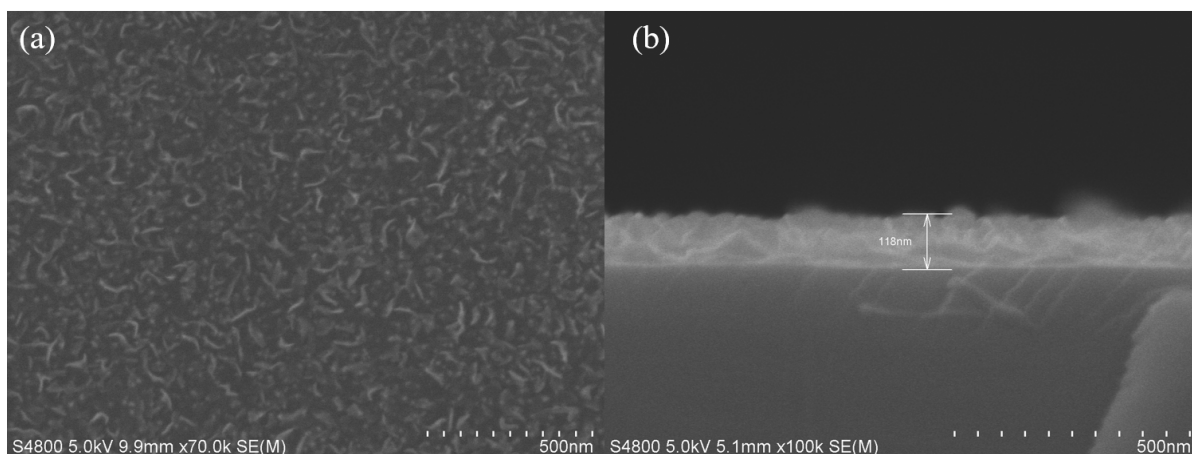


Figure S9. (a) SEM images of the 40 mins PECVD grown graphene (b) cross-sectional SEM images of the 40 mins PECVD grown graphene.

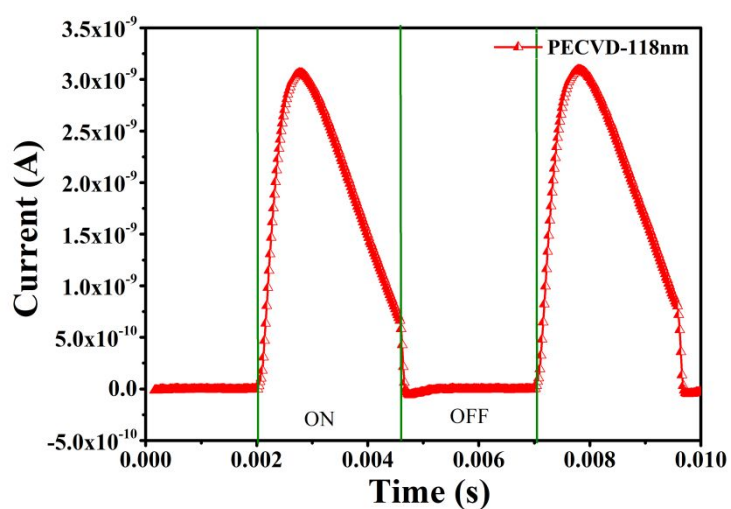


Figure S10. Photo-switching curves of the photodetectors under a pulsed light irradiation of 1342 nm. The intensity of the light source was fixed at $100 \mu\text{W}/\text{cm}^2$.