

Supplementary Information

Opening the band gap of graphene through silicon doping for improved performance of graphene/GaAs heterojunction solar cells

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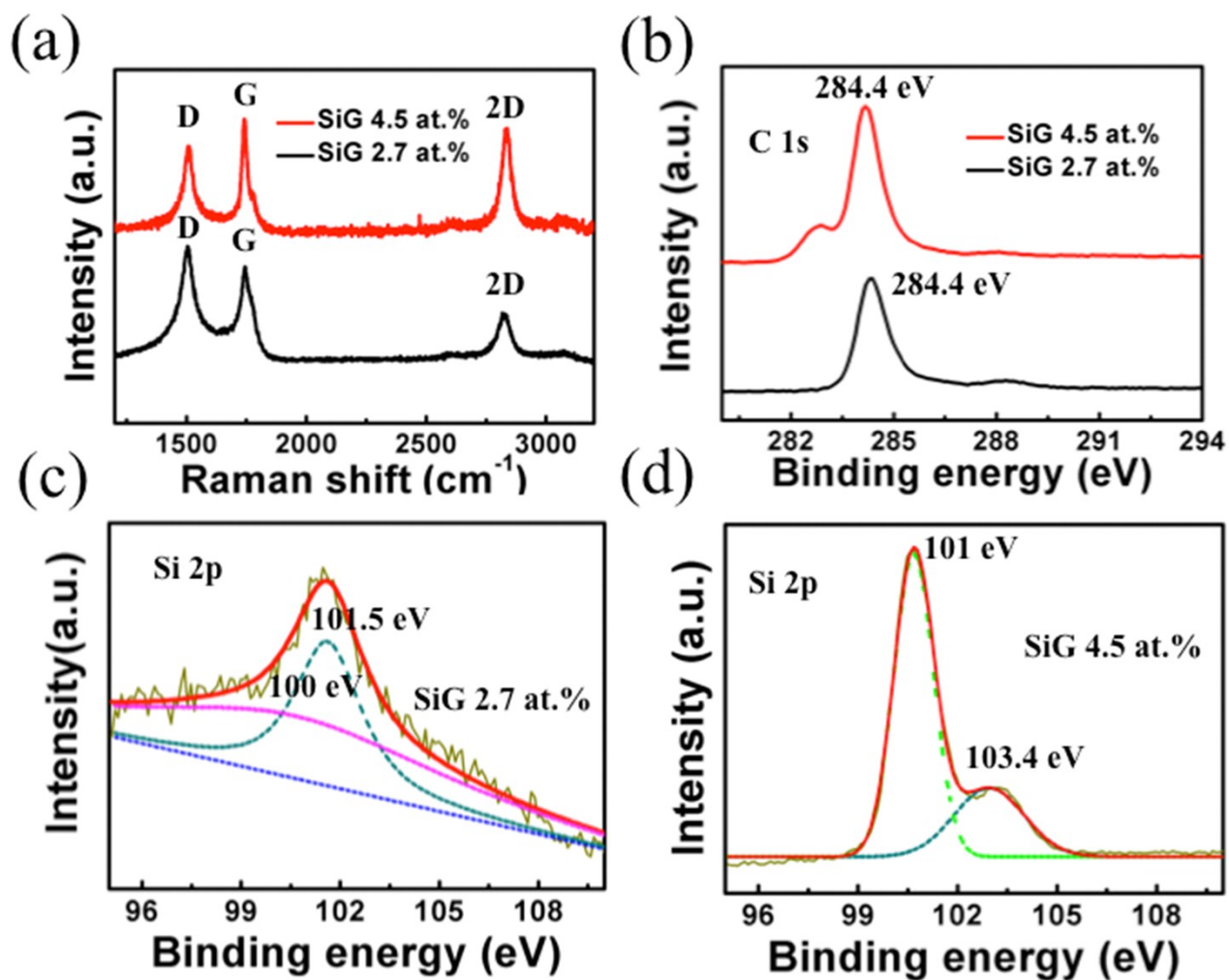


Figure S1. (a) Raman spectra of SiG with Si concentration of 2.7 at.% and 4.5 at.% on SiO_2/Si substrate. (b)-(d) XPS spectra of SiG with Si concentration of 2.7 at.% and 4.5 at.%, respectively.

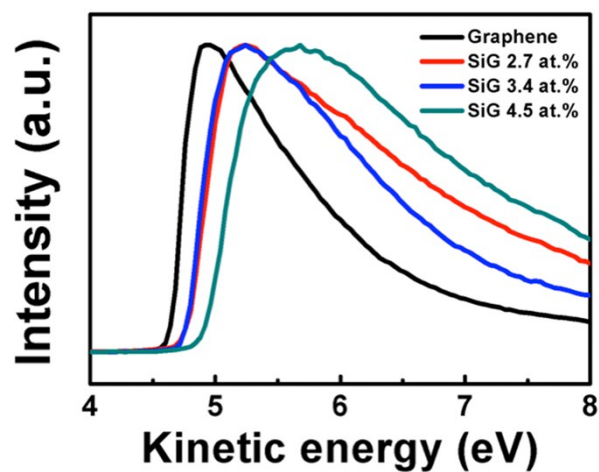


Figure S2. UPS spectra of SiG with different Si concentration, where we can see that the work function of SiG with the concentration of 2.7 at.%, 3.4 at.% and 4.5 at.% is 4.63 eV, 4.63 eV and 4.75 eV, respectively, while that of graphene is 4.5 eV.

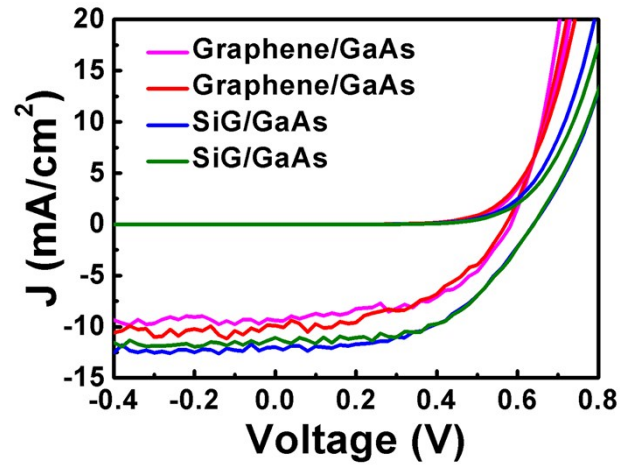


Figure S3. (a) The dark current density-voltage (J-V) curve of SiG and graphene/GaAs solar cells. (b) The current density-voltage (J-V) curve of current density-voltage (J-V) curves of the solar cell with SiG and graphene under AM1.5 illumination at 100 mW/cm².

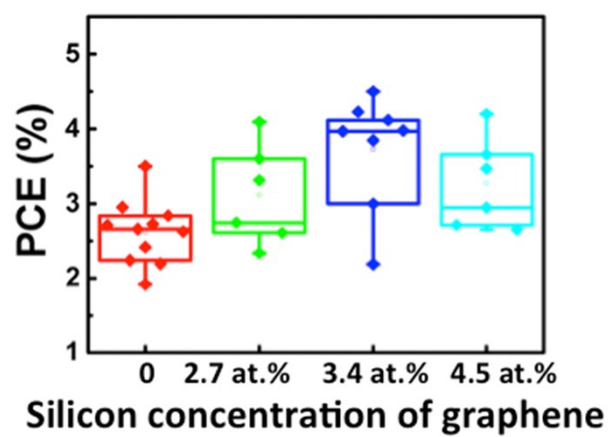


Figure S4. PCE of SiG /GaAs solar cells with different silicon concentration.

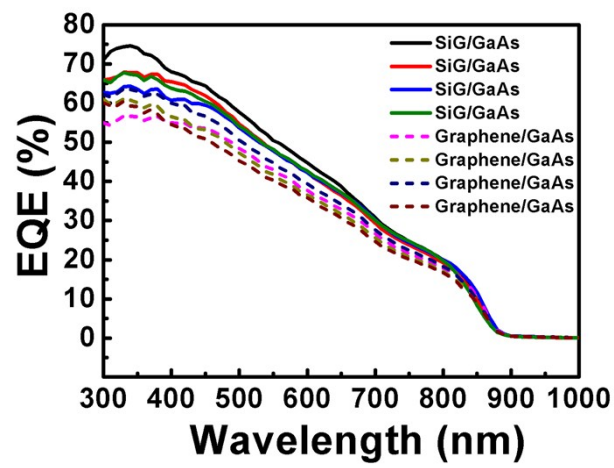


Figure S5. EQE of graphene/GaAs and SiG/GaAs solar cells

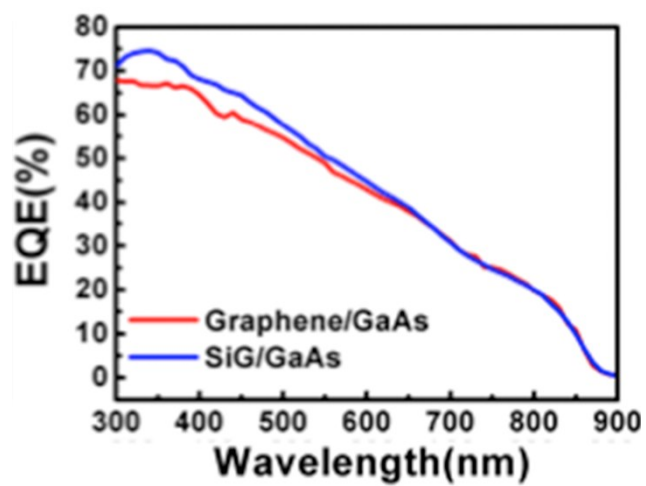


Figure S6. EQE of graphene/GaAs and SiG/GaAs solar cell

Table S1. Different parameters between SiG and graphene/GaAs solar cells.

	J_{sc} (mA/cm ²)	V_{oc} (V)	FF	PCE (%)	ϕ_{SBH} (eV)	η
Graphene/GaAs (pink line)	9.36	0.57	53.8	2.87	0.76	2.37
Graphene/GaAs (red line)	9.97	0.58	47.4	2.74	0.75	2.30
SiG/GaAs (blue line)	11.15	0.64	53.9	3.97	0.83	2.05
SiG/GaAs (green line)	12.03	0.64	51.7	3.98	0.83	2.05

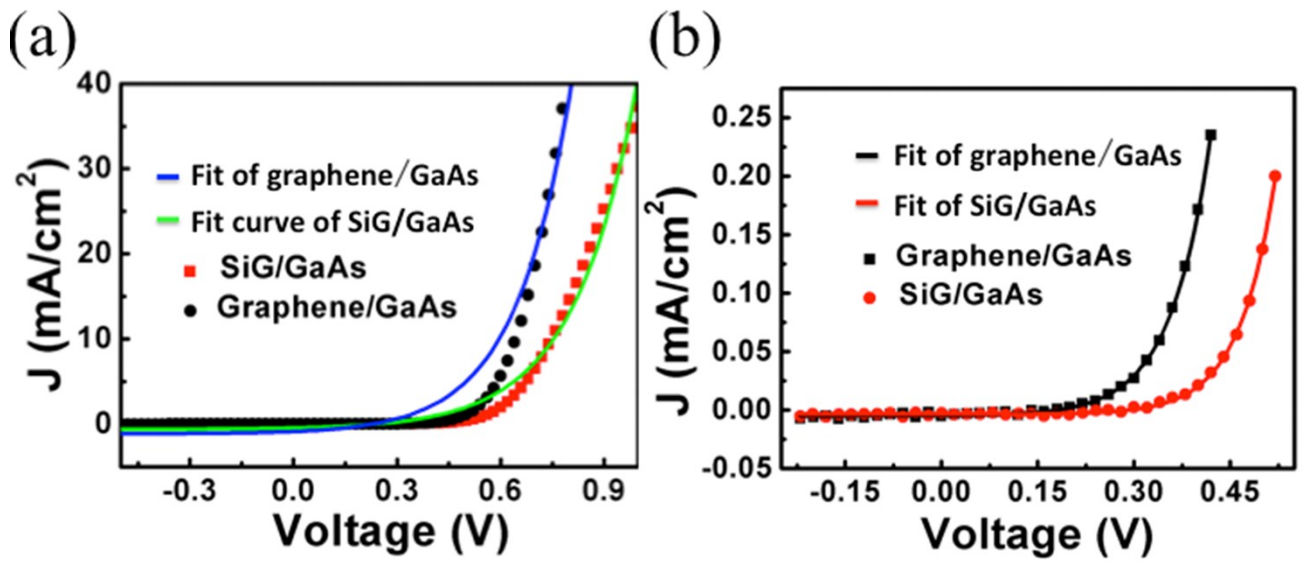


Figure S7. (a)-(b) The dark current density-voltage (J - V) and fitting curves of SiG and graphene/GaAs solar cells in the voltage range from -0.5 V - 1V and -0.25 V - 0.55 V, respectively.

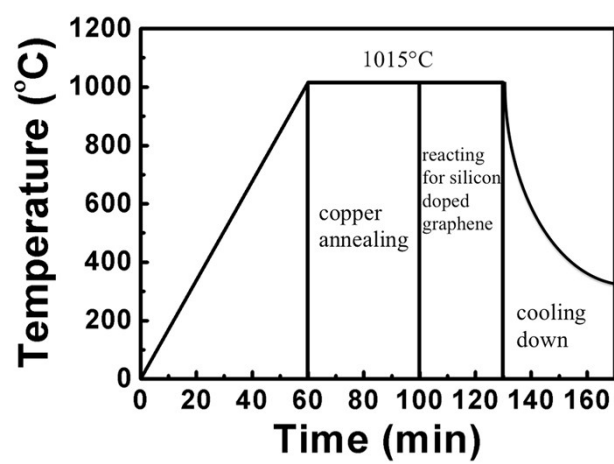


Figure S8. Synthesizing process of SiG sheet.