Electronic Supplementary Material (ESI) for Nanoscale

Efficiency Enhancement of Graphene/Silicon-Pillar-Array Solar Cells by HNO_3 and PEDOT-PSS

Supporting information

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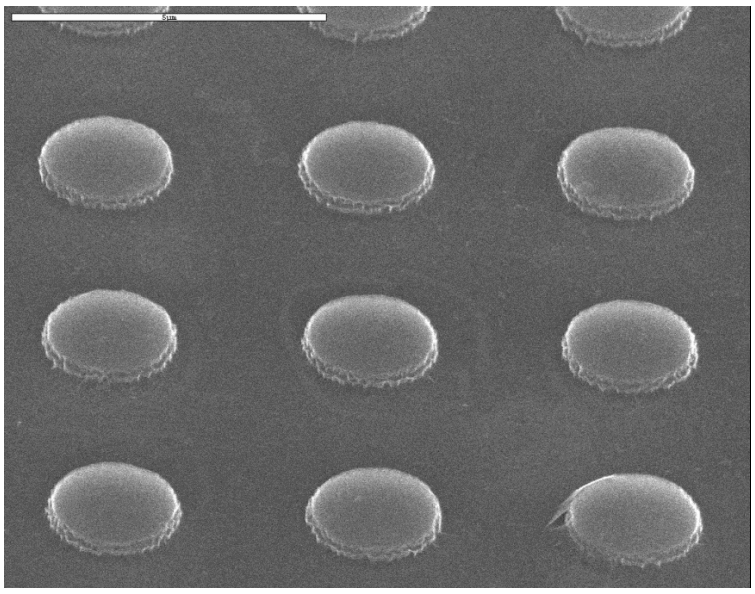
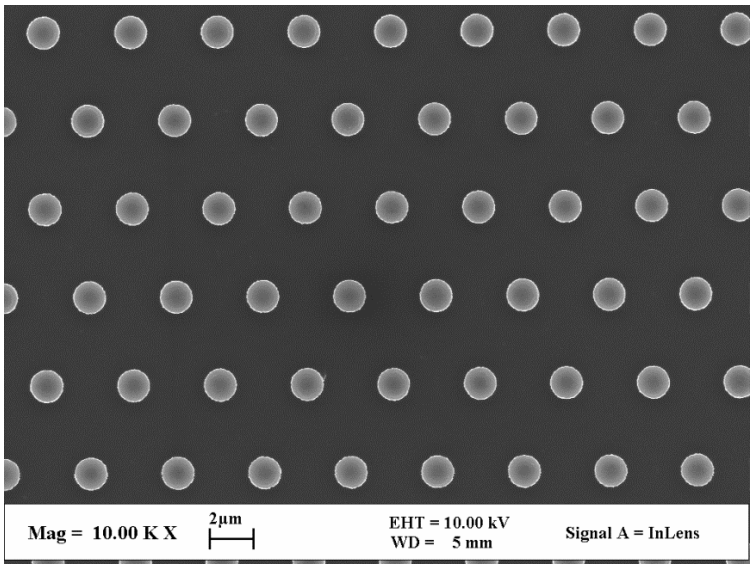
A. The SEM images of prepared silicon-pillar-array (SPA) substrate



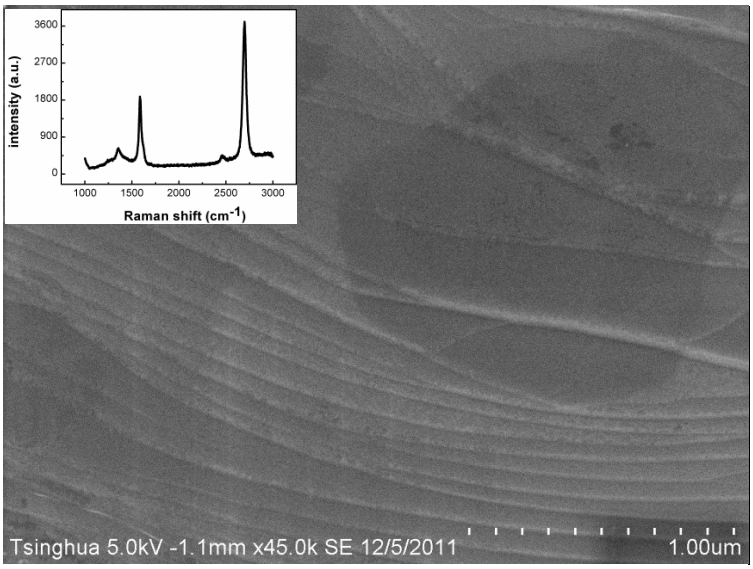
S1. The tilt view SEM image of the SPA substrate.



S2. The top view SEM image of the SPA substrate.

B. Graphene growth

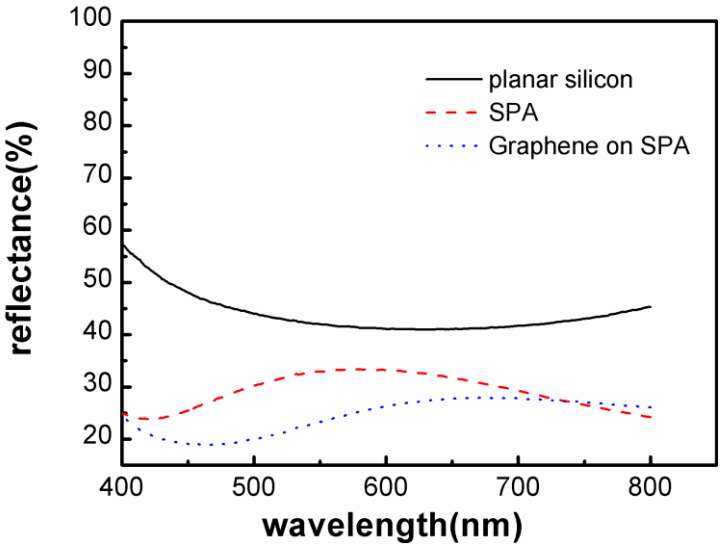
Graphene film was synthesized on copper foil by CVD method. Copper foil of 25μm in thickness was washed with diluted hydrochloric acid for 10 min in ultrasonic bath to remove the metal oxide layer and impurities, then in deionized water for 10 min and dried with nitrogen gas. The prepared copper foil was then located at the center of the quartz tube, which was heated to 1000 °C at the rate of 20°C/min under the reducing atmosphere (Ar:H_2=400:100 mL/min). Then the temperature was held for 30 min for the growth of Cu crystal grain. Methane was used as the carbon source. The precipitation of the graphene film was carried out for 20min, with a flow of Ar:CH_4 = 200:10 mL/min under air atmosphere. After that the tube were cooled down to room temperature at a cooling rate of 10 °C/s under the flow of Ar and H_2 mixed atmosphere.



S3. The SEM image of graphene grown on copper foil by CVD method. Inset shows the Raman spetra of graphene which has been transferred on SiO_2/Si substrate.

C. Reflectance spectra of SPA substrate

The reflectance of SPA substrate and planar silicon substrate were tested. The results demonstrate the SPA substrate does show an anti-reflective property, which therefore is more advantageous for solar cell performance.



S4. The reflectance spectra of planar silicon substrate, SPA substrate and SPA substrate with graphene film in visible region (400nm - 800nm).