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Solar cell architectures by combining graphene and carbon nanotubes with silicon

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There is intensive efforts in exploring innovated solar cell structures with high performance and cost-effective manufacturing methods. In this frame, emerging competitive technologies include the combination of inexpensive materials with conventional silicon wafers silicon. We will present graphene, carbon nanowires-Si junction solar cells with high efficiencies by coating an antireflection layer. We have used a titanium oxide coating because significantly inhibits light reflectance from the Si surface, resulting in an enhanced short-circuit current and external quantum efficiency.
Solar cell characteristics were tested by a source meter, we have obtained the J-V curves (0- 0.6 eV) and the IPCE (300- 1200 nm). The light-to-electricity conversion in the solar cells involves several key steps, including light absorption, charge separation and carrier collection. The light absorption step determines how much fraction of incident photons can be absorbed by the semiconductor and the excitation of charge carriers. We have also measured the surface roughness because light reflection from polished silicon could be even 36%, resulting in significant energy loss in the light absorption stage, for this reason a suitable aspect ratio is required. The surface roughness has checked by electron irradiation the samples as a function of the incidence angle of the primary electrons (0-1000eV).

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