

Controlled growth and self-assembly of single-walled carbon nanotubes for solar cell applications

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Abstract: We have modulated the diameters and morphologies of SWNTs for the applications of SWNT/Si solar cells. The vertically aligned single-walled carbon nanotubes with average diameter of less than 1 nm have been synthesized through alcohol-catalytic CVD method. Moreover, a breath figure directed self-assembly method for has been developed for the application of SWNT/Si solar cells. The hierarchical 3D honeycomb-like architecture of SWNTs was obtained using the breath figure technique, where water vapor condenses on the surface of vertical-aligned SWNT and forms hexagonal pattern. The micro-honeycomb network consists of vertical aggregated SWNT walls and a buckypaper bottom. This hierarchical structure exhibits lower sheet resistance and higher optical transmittance compared with the buckypaper. The honeycomb networked SWNT film was transferred onto the 3 mm by 3 mm n-type silicon substrate by hot water thermocapillary method. Through modeling, the honeycomb-networked SWNT film shows much smaller series resistance than random-oriented SWNT film [1][2].

Reference:

- [1] K. Cui *et al*, J. Mater. Chem. A, **2014**, 2: 11311-11318.
- [2] K. Cui *et al*, J. Phys. Chem. Lett., **2013**, 4: 2571-2576.