

Carbon nanotubes and graphene for next generation solar cells

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A film of single-walled carbon nanotubes (SWNTs) can be a dual-functional layer as electron-blocking-layer and transparent electrode in various solar cells. We have demonstrated efficient SWNT/Si solar cells using dry-deposited high-quality SWNTs and honeycomb-structured SWNTs [1-3]. Adequately doped mm scale single crystal graphene [4] also exhibited the similar performance. The dual functionality is also demonstrated for organic and perovskite solar cells. For organic solar cells, the SWNT/MoOx/PEDOT:PSS layer was demonstrated as a dual functional layer replacing ITO and organic electron-blocking-layer. By replacing ITO, the flexible device can be easily demonstrated [5]. Similar replacement of ITO was demonstrate for Perovskite type solar cells [6]. On the other hand, it is also possible to replace electron blocking layer and metal electrode for both organic [7] and Perovskite solar cells [8]. This direction is promising for low cost device fabrication and semi-transparent solar cells.

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