CVD Growth of Self-Organized Micro-Honeycomb Network Structure of Single-Walled Carbon Nanotubes for Photovoltaic Devices

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For photovoltaic devices, so far, spaghetti-like thin film of single-walled carbon nanotubes (SWNTs) known as bucky paper or vertically aligned SWNT (VA-SWNTs) have been examined for SWNT/Si heterojunction solar cells or counter electrode of dye-sensitized solar cells. Here, we propose a self-organized micro-honeycomb network structure of SWNTs obtained by water vapor treatment of as-synthesized VA-SWNTs for solar cell devices with higher performance.

The SWNT/n-Si heterojunction solar cell was built by placing the micro-honeycomb SWNTs network film on top of the substrate which has a 3 mm x 3 mm bare n-type silicon contact window in the center. Our preliminary tests showed that optimal photovoltaic conversion efficiency (PCE) under AM1.5 was 5.1%, with the fill factor of 46%. Furthermore, the superior performance of dye-sensitized solar cells with the micro-honeycomb SWNTs will be discussed.

Part of this work was financially supported by Grant-in-Aid for Scientific Research (22226006, 19054003), JSPS Core-to-Core Program, and Global COE Program 'Global Center for Excellence for Mechanical Systems Innovation'.