

Application of Vertically-Aligned SWNT Films for the Counter Electrode of Dye-Sensitized Solar Cells

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We have been attempting to use vertically aligned single-walled carbon nanotube (VA-SWNT) films [1] synthesized by ACCVD method [2] for counter electrodes (CEs) of dye-sensitized solar cells (DSCs). Previously [3], we developed a solar cell in which VA-SWNT films were used for a CE, in place of conventional sputtered Pt on fluorine-doped tin oxide (FTO) layers, by transferring a VA-SWNT film on a FTO-coated glass substrate using our hot-water detachment technique [4]. However, I-V curves of the fabricated solar cells showed smaller *fill factor* than our reference solar cell in which sputtered Pt was used for CE. Based on fitting analyses on these I-V characteristics using the one-diode equivalent circuit model [5], we attributed the small fill factor in the developed cell to contact resistance at the interface between the SWNT film and the FTO layer.

In the present study, in order to reduce the contact resistance, we adopted Si substrates deposited with Au/Cr metallic bilayer (Fig. 1), instead of the FTO-coated glass substrates. Figure 2 shows an improvement of the fill factor achieved by this change. We will discuss the reason of this improvement as well as the possibility of replacing conventional Pt/FTO CEs with VA-SWNT films in DSCs.

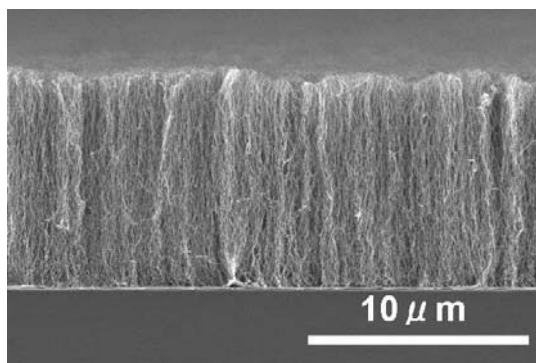


Fig. 1 SEM image of transferred SWNT film on the Au and Cr deposited on a Si substrate.

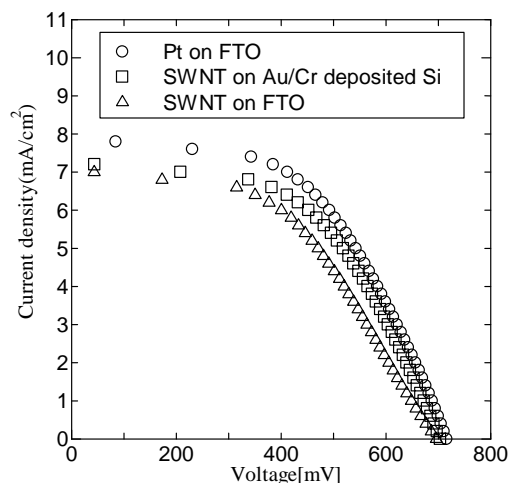


Fig. 2 I-V characteristics of DSCs with Pt and SWNT CEs.

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