

Spectral sensitivity of photovoltaic cells based on carbon nanotube arrays

Study background

Technology

- Substrate – n-type silicon (100). To form “strip” sample substrate was subjected to chemical treatment with further oxidation at 1000 °C for 200 nm SiO₂ thickness. Next, an Al film (300 nm) was deposited. To form the topology, photolithography was performed followed by etching of Al and SiO₂ films to Si. The final operation is cutting the wafers into individual chips. The production of the type “comb” sample was carried out similarly, but with the addition of a gas—phase etching operation of SiO₂ (thickness of 100 nm) under the metallization layer, before the final CNT deposition.
- SWCNTs suspension 0.1 mg/ml (Sigma-Aldrich, ~ 95 % semiconducting tubes with ~ 41 % of (6,5) chirality) - deposited by the spray method. The average number of spray passes was 500 times.

Research methodology

Spectral sensitivity were obtained in the UV – Near-Infrared wavelength with setup for measuring parameters of dye-sensitized solar cells (SCS10-PEC, Zolix). Radiation source – 500 W xenon lamp.

Experimental results

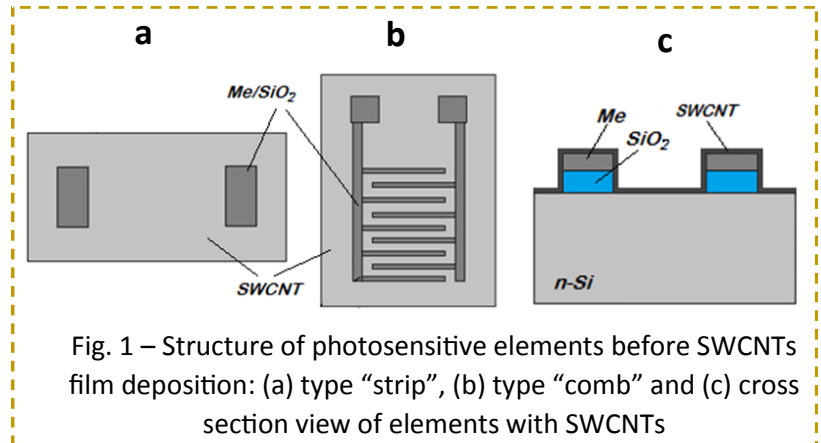
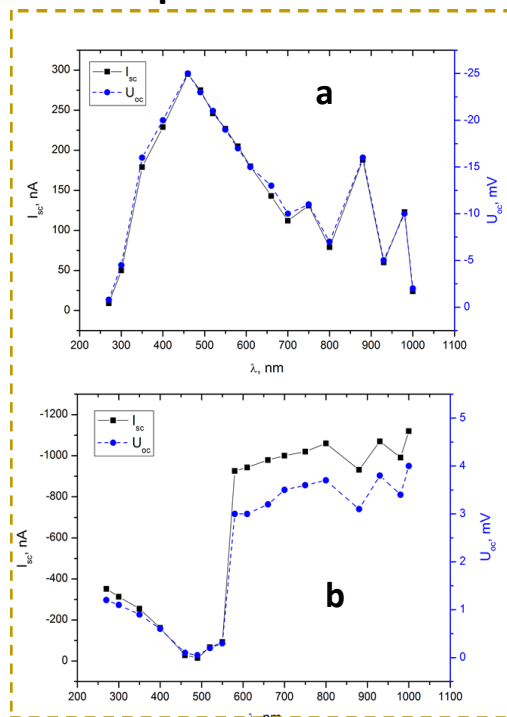


Fig. 1 – Structure of photosensitive elements before SWCNTs film deposition: (a) type “strip”, (b) type “comb” and (c) cross section view of elements with SWCNTs

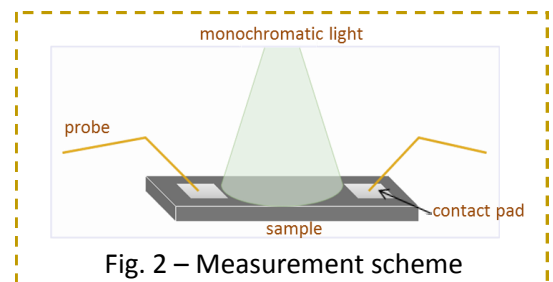


Fig. 2 – Measurement scheme

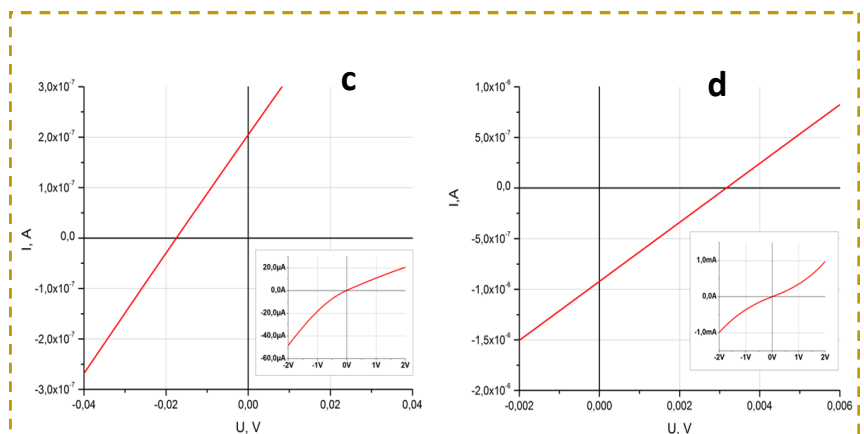


Fig. 3 – Graphs of: spectral sensitivity for photovoltaic cells of type “strip”(a) and “comb” (b); and IU-curves when illuminated at 580 nm for “strip”(c) and “comb” (d) samples respectively