SW-NT effect on solution-based IGZO TFTs

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Effect of Single-Walled Carbon Nanotube Concentration on the Electrical Properties of Solution-Based Indium Gallium Zinc Oxide Thin Film Transistors

In this work, we have fabricated thin film transistors (TFTs) from a solution-based indium gallium zinc oxide (IGZO) and single-walled carbon nanotube (SWNT) blend by varying SWNT concentration. In order to improve electrical performances of IGZO TFT, SWNTs were used as carrier transport rods. We found out that the saturation field effect mobility (μsat) and on/off current ratio varied when the SWNT concentration changed. The concentration of SWNT in the solution is a critical parameter to control the electrical performances of IGZO TFT. The optimized performance of IGZO TFT with 0.04 wt.% SWNT concentration is as follows: μsat of about 0.11 cm^2/Vs, an on/off current ratio of ~ 10^5, threshold voltage (V_{th}) of −2.5 V, and a subthreshold slope (S-factor) of 4.1 V/decade.

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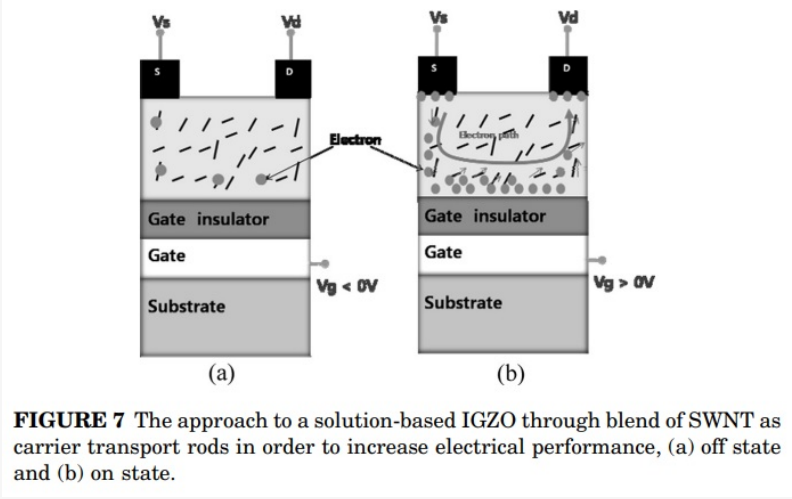

FIGURE 7 The approach to a solution-based IGZO through blend of SWNT as carrier transport rods in order to increase electrical performance, (a) off state and (b) on state.

Figure 7 shows our approach to a solution-based IGZO TFT through blend of SWNTs as carrier transport rods in order to increase electrical performance of TFTs. There is no leakage current that electrons are caught by SWNTs at off state as shown Figure 7(a). For on state as shown Figure 7(b), electrons flow through SWNT pathway faster than normal channel without SWNT.

Keywords

Carrier transport rod;Indium gallium zinc oxide;Single-walled carbon nanotube;Solution process;Thin film transistor