

Type conversion of carbon nanotube thin-film transistors using PVA/SU-8 polymer layer

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Single-walled carbon nanotubes (SWNTs) hold great potential as channel material for thin-film transistor applications due to unique electrical properties, such as high intrinsic carrier mobility and current-carrying capability. Compared with other popular TFT channel materials, such as polysilicon, amorphous silicon, or organic materials, carbon nanotube based TFTs have the advantages of room temperature processing compatibility, transparency, flexibility as well as high device performance. However, carbon nanotube based TFTs are still faced problem which is lack of a reliable way to obtain n-type carbon nanotube TFTs. that limit the applications in large-scale digital integrated circuits. Recently, many groups have demonstrated high performance TFTs using semiconducting carbon nanotubes. However, how to obtain air stable n-type carbon nanotube TFTs reliably still remains a big challenge. Although n-type CNT TFTs can be achieved by chemical doping or using metal contacts with low work functions such as Gd, Sc, or Y, the reliability as well as long-term air stability of those techniques has to be further improved. Latest report shows that passivating the individual nanotube transistors using HfO₂ layer is an effective and air stable method to convert the devices into n-type. This method is relatively easy, very reliable, and robust, offers long term air stability. In this study, we deposited C-PVA/SU-8 passivation layer on carbon nanotube thin-film transistors by spin coater. After that, carbon nanotube TFTs were baked in Ar atmosphere at 150 degrees. The measurement of electrical properties revealed that p-type carbon nanotube TFTs were converted to n-type CNTFETs after PVA/SU-8 deposition. carbon nanotube TFTs that were deposited only SU-8 layer still had p-type electrical properties. And after the passivation (SU-8 or PVA/SU-8), the hysteresis gap was much reduced, than before the passivation.

Biography

In present, I'm in senior grade of incheon national university and will go to do the master's course. I'm in Hybrid multiscale-materials and Device Lab of Incheon national University School.

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