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Abstract
In the objective of thesis, we will fabricate the high efficiency of organic thin film transistor (OTFT). The OTFT have received considerable attention recently because it can be fabricated on the Flexible plastic at low temperature and potentially reduced cost compared to hydrogenated amorphous silicon thin-film transistors. Therefore, it can combine the Organic Thin Film Transistor (OTFT) with Organic Light Emission Diode (OLED) technology on the plastic substrate to form the active of flexible display.
Thus, the electronic characteristic of OTFT is not very perfect; its current density is very low that it can not drive the device, like Organic Light Emission Diode (OLED) or Liquid Crystal Display (LCD). And the quality of organic semiconductor layer in the OTFT is one of the main influences to affect the carrier mobility. So we necessary increase the carrier mobility of OTFT by different manufacturing conditions.
In order to obtained higher performance of OTFT, the different manufacturing conditions that affect the characteristics of OTFT will discussion in this thesis. It is well known that the different manufacturing conditions involve: (A) the gate dielectric layer chemically modified with Octadecyltrichloro-silane (OTS) is conducive to the order of organic molecular very well on it; (B) Investigation of the organic layer thickness is conducive to reduce the effective resistance in it; (C) Investigation of the different annealed temperatures is conducive to improve the quality of the organic film; (D) Investigation of the different materials about the drain and source electrode is conducive to the carrier inject into the organic layer from electron. The different manufacturing conditions were briefly described in subsequently text
(A) Firstly, we focused on the use of gate dielectric layer chemically modified with Octadecyltrichloro-silane (OTS). OTS is always used in OTFT; it forms self-assembled monolayers (SAMs) on gate dielectric layer. It can decrease the roughness on the surface of dielectric layer with OTS treating, and reduce the trap between organic semiconductor and gate dielectric layer. Therefore, the result can be conducive to the order of organic molecular very well on the gat dielectric layer with OTS treating.
(B) The effective resistance in organic semiconductor layer is variation with different structure or thickness of the organic semiconductor layer. However, the effective resistance include that Rch is the effective resistance in the channel, Ri is the effective resistance between the contact and organic layer, and Rs is the effective resistance in the vertical direction of organic semiconductor layer.

Therefore, it can reduce the effective resistance in it with discussion of organic film thickness.
(C) In the semiconductor manufacturing, the thermal annealing manufacturing used to improvement the quality of film. Therefore, it is used in the OTFT to reduce the trap and increase the carrier mobility.
(D) The different materials about the drain and source electrode is discussed. Because the Ri which is the effective resistance between the contact and organic layer can influence the carrier mobility, too.
The analysis of OTFT device by means of X-ray diffraction (XRD), Atomic Force Microscopy (AFM), Scanning Electron Microscope (SEM) and Fourier transform infrared (FT-IR). And all current-voltage (I-V) measurements on our pentacene OTFT were performed with a Keithley 4200 Semiconductor Parameter Analyzer.
To conclude, we can improve the carrier mobility increased obviously from 0.00327cm2/V.s (TC structure) to 0.91cm2/V.s with different manufacturing conditions.
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