Influence of the thermal annealing on the electrical stability of N-type C_{60} based Organic Thin Film Transistors

Z.Tao, T. Mohammed-Brahim, M. Harnois, E. Jacques
Université de Rennes1- IETR/ Département Microélectronique et Microcapteurs – Campus Beaulieu - Bat 11B 35042 Rennes Cedex

E-mail: tz-0001@163.com

Based on the advantages such as flexibility, solution processability and low cost, organic electronics are considered as the next generation of electronics. In addition, organic electronic devices have been utilized in flat panel display, memory devices, complementary circuits, and chemical or biological sensors [1,2]. Solution processed organic electronic devices become now the main challenge in reaching low cost flexible electronics. It faces to many issues as the control of the surface wetting before the deposition, modification of the environment in process of drop casting deposition, the used solvent and the post-treatment. All these issues lead usually to non-reproducibility of the process and to electrical instability of the device under polarization.

Here bottom-gate bottom-contacts N-type transistors, which the structure is shown in Figure 1a, were fabricated. The gate, drain and source contacts are made on printed silver. The gate insulator is a film of SU8 photoresist [3] and the active layer is a film of thermally evaporated C_{60} [4].

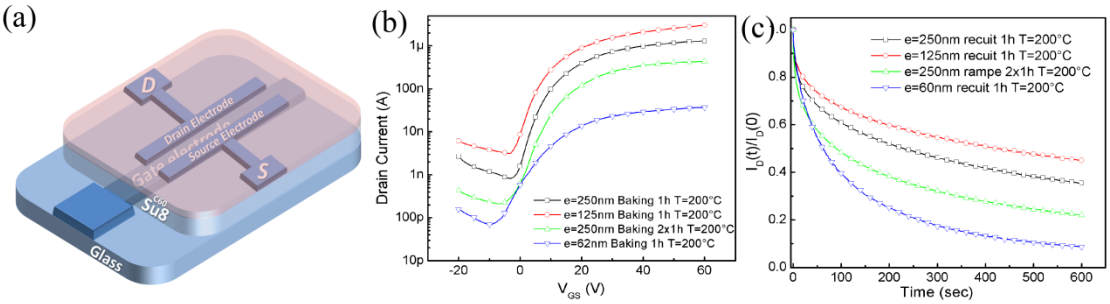

Fig1.(a) the structure of the transistor. (b) Transfer Characteristic of C60 printed OTFTs as a function of C60 thickness and annealing time at 200 ℃. (VDS=20V, W/L=4000 µm/150 µm). (c) Electrical stability of OTFTs of Fig.1.(b) as evaluated from the decrease of the drain current with the time under constant bias (VDS=20V, VGS=40V)

In this paper, the effect of the thermal annealing of this active layer on the process reproducibility and on the electrical stability of the total structure is studied. The study included the effects of the final annealing temperature and the duration of the annealing at this temperature on OTFTs with differently thick active layer. An optimum of active layer thickness linked to the annealing time is found. This optimum led to reproducible process and uniform parameters of OTFTs distributed on the surface of the sample.

References:

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