EFFECT OF DIFFERENT A-InGaZnO TFTs CHANNEL THICKNESS UPON SELF-HEATING STRESS

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In this work, Indium-Galium-Zinc-Oxide Thin Film Transistors (IGZO TFTs) with different channel thickness has been compared after self-heating stress (SHS). In previous literatures, self-heating of TFTs has been widely discussed and Joule Heat caused during driving TFTs has been compared with different channel length and width [1]. However, different channel thickness hasn't been investigated. Although TFTs with a larger channel thickness possess a greater drain current, a less degradation is observed when comparing with small channel thickness structures, demonstrated in Figure 1(a). The ΔVt shift in the transfer characteristics are well described by the stretched-exponential equation. The E_T value, which is the average effective barrier height for electron transport, is extracted in Figure (b). Results has shown that in the thick IGZO TFTs, the value is almost twice of that in the thin IGZO TFTs. From COMSOL simulations demonstrated in Figure 1(c), in could be noticed that different channel thickness effects the electrical field locating at the gate insulator. Therefore, a model is proposed to explain the degradation difference, illustrated in Figure (4).

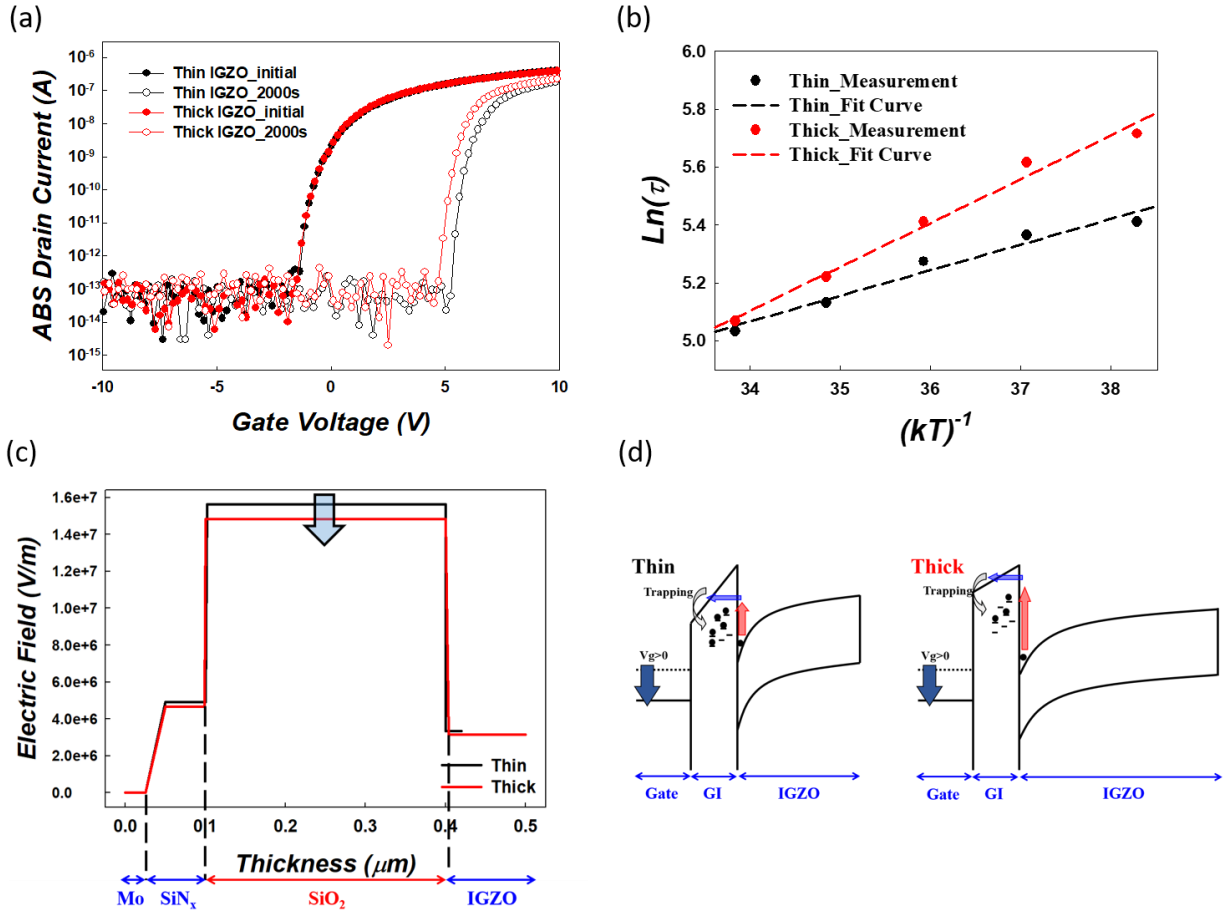

Figure 1 – (a) Transfer characteristics of two different channel thickness in a-IGZO TFTs (b) Time constant τ as a function of reciprocal temperature (c) Simulation of electrical fields by COMSOL (d) The schematic diagram of different channel thickness during charge injection between the channel and gate insulator

Reference:
[1] Satoshi Inoue, Hiroyuki Ohshima, Tatsuya Shimoda, Jpn. J. Appl. Phys. Vol. 41 (2002) pp. 6313–6319