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Temperature dependent instability of drain bias stress in amorphous Indium-Gallium-Zinc-Oxide thin film transistors

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This paper investigates the behavior of drain bias stress at high temperature for amorphous Indium-Gallium-Zinc-Oxide thin film transistors (a-IGZO TFTs). The abnormal electrical characteristics exhibit a two-stage degradation behavior during drain bias stress, and are explained by the energy band diagrams. The thermal-excited non-uniform hole trapping in the drain region induces drain side barrier lowering and causes an apparent hump phenomenon in the subthreshold swing. This phenomenon only appears at high temperature, above 400K, and is experimentally verified. This work also employs capacitance-voltage measurement to confirm the proposed mechanism. Moreover, we applied a technology computer-aided design (TCAD) simulation system to further clarify the mechanism of degradation behaviors.