CONTACT EFFECTS TOWARDS MAINSTREAM THIN-FILM TRANSISTOR APPLICATIONS

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Thin-film source-gated transistors (SGTs) [1] have been developed steadily over the last couple of decades, demonstrating important properties which span virtually all thin-film material systems [2], [3]. By virtue of their control mechanism, which relies on an energy barrier deliberately engineered at the source, they present impressive intrinsic gain [4], [5], tolerance to variability [6], stability [7], and temperature sensing utility [8]. Recently, numerous groups have adopted the architecture [2], [3] and conceptual evolutions have led to new and highly functional TFT devices [9]–[11].

As the contact-controlled nature of these transistors introduces a relatively large temperature dependence of drain current, and also drastically reduces the current density, for a given geometry, recent research (Fig. 1-3) is focusing on shifting the balance away from these limitations [12]–[14], without compromising the structure's advantages.

This paper outlines the recent understanding of SGT behavior and offers new insights into potential topical applications.

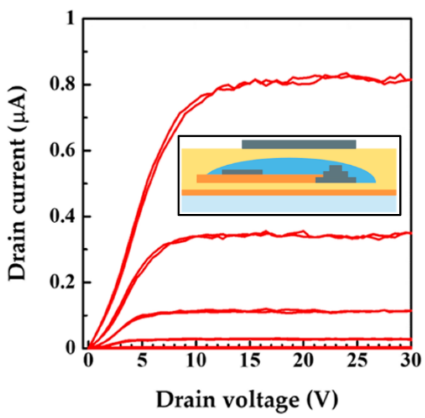

Figure 1 – Structuring the source contact geometry provides drain field relief, after [12].

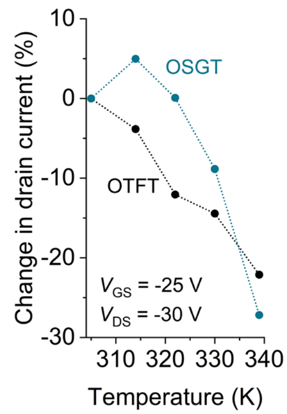

Figure 2 – Significant reduction of temperature dependence of drain current achieved via interplay between contact and semiconductor properties [13].

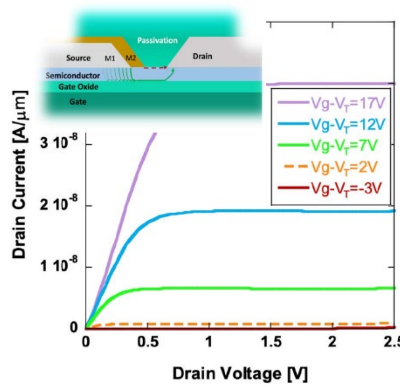

Figure 3 – Current density can be improved via source contact engineering [14].

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