

Roll-to-Roll Fabrication of Flexible Low-operating Voltage Organic FETs using Solution-based Hybrid High-K Dielectrics

Organic field effect transistors (OFETs) are key for flexible, lightweight, and inexpensive electronic devices. Low-voltage operation of OFETs is necessary for many practical applications and all solution-based, low-temperature processes are desirable as they provide a significant cost advantages for scaling to large area roll-to-roll fabrication processes. To meet these challenges the CHM has developed solution-based high- k dielectric coatings consisting of zirconia (ZrO_2) nanoparticles in a polymer composite.

OFET DEVICE PERFORMANCE

The drain current-voltage characteristics for an OFET device having a high- k gate dielectric film composition of 50% ZrO_2 nanoparticles is shown in Figure 1. The corresponding gate voltage transfer characteristics shown in Figure 2 demonstrate a threshold voltage of $V_{th} \sim -0.8V$, with device ON/OFF ratio $\sim 5.0 \times 10^3$. The charge mobility is $0.08 \text{ cm}^2/(V\cdot s)$. The devices exhibit a low leakage current of $\sim 1.6 \times 10^{-6} \text{ A cm}^{-2}$ at an applied voltage of -3.5 V (1 MV/cm).

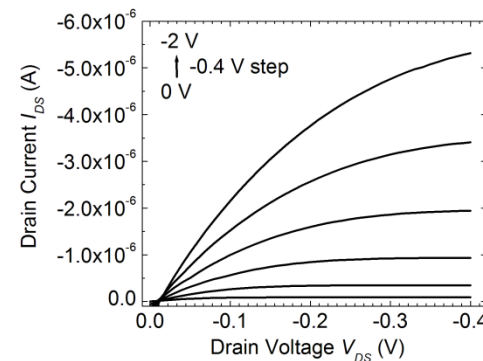
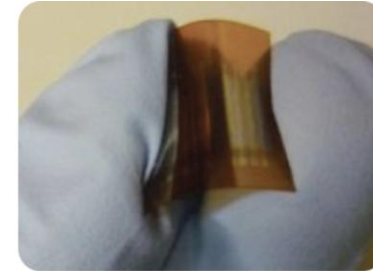


Figure 1

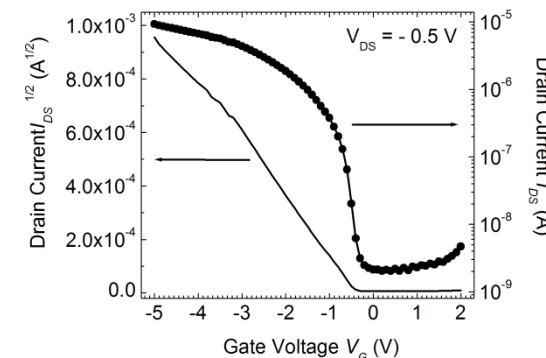


Figure 2

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