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Switching Characteristics of Amorphous GeSe TFT for Switching Device Application

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We fabricated TFT devices with the GeSe channel. A single device consists of a Pt source and drain, a Ti glue layer and a GeSe chalcogenide channel layer on SiO2/Si substrate which worked as the gate. We confirmed the drain current with variations of gate bias and channel size. The I-V curves of the switching device are shown in Fig. 1. The channel of the device always contains amorphous state, but can be programmed into two states with different threshold voltages (Vth). In each state, the device shows a normal Ovonic switching behavior. Below Vth (OFF state), the current is low, but once the biasing voltage is greater than Vth (ON state), the current increases dramatically and the ON-OFF ratio is high. Based on the experiments, we draw the conclusion that the gate voltage can enhance the drain current, and the electric field by the drain voltage affects the amorphous-amorphous transition. The switching device always contains the amorphous state and never exhibits the Ohmic behavior of the crystalline state.

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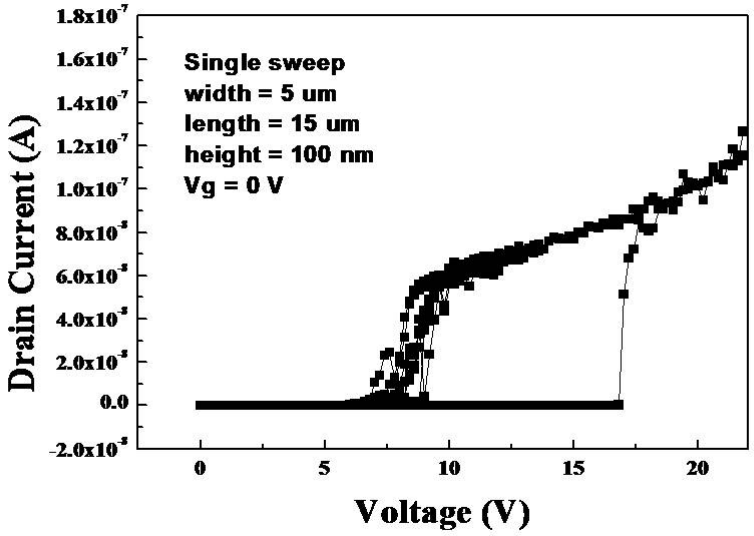
Keywords: amorphous chalcogenide, GeSe, TFT


Single sweep
width = 5 um
length = 15 um
height = 100 nm
Vg = 0 V
Drain Current (A)
Voltage (V)
1.8x10-7
1.6x10-7
1.4x10-7
1.2x10-7
1.0x10-7
8.0x10-8
6.0x10-8
4.0x10-8
2.0x10-8
0.0
-2.0x10-8
0
5
10
15
20