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# Flexibility Improvement of InGaZnO Thin Film Transistors Using Organic/inorganic Hybrid Gate Dielectrics

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Recently, oxide semi-conductor materials have been investigated as promising candidates replacing a-Si:H and poly-Si semiconductor because they have some advantages of a room-temperature process, low-cost, high performance and various applications in flexible and transparent electronics. Particularly, amorphous indium-gallium-zinc-oxide (a-IGZO) is an interesting semiconductor material for use in flexible thin film transistor (TFT) fabrication due to the high carrier mobility and low deposition temperatures. In this work, we demonstrated improvement of flexibility in IGZO TFTs, which were fabricated on polyimide (PI) substrate. At first, a thin poly-4vinyl phenol (PVP) layer was spin coated on PI substrate for making a smooth surface up to 0.3 nm, which was required to form high quality active layer. Then, Ni gate electrode of 100 nm was deposited on the bare PVP layer by e-beam evaporator using a shadow mask. The PVP and $Al_2O_3$ layers with different thicknesses were used for organic/inorganic multi gate dielectric, which were formed by spin coater and atomic layer deposition (ALD), respectively, at 200°C. 70 nm IGZO semiconductor layer and 70 nm Al source/drain electrodes were respectively deposited by RF magnetron sputter and thermal evaporator using shadow masks. Then, IGZO layer was annealed on a hotplate at 200°C for 1 hour. Standard electrical characteristics of transistors were measured by a semiconductor parameter analyzer at room temperature in the dark and performance of devices then was also evaluated under static and dynamic mechanical deformation. The IGZO TFTs incorporating hybrid gate dielectrics showed a high flexibility compared to the device with single structural gate dielectrics. The effects of mechanical deformation on the TFT characteristics will be discussed in detail.

**Keywords:** Oxide TFT, IGZO