Electrical Properties of the Thin-Film Transistor with Copper-Indium Oxide Channel

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For several years, due to their electrical characteristics, thin-film transistors(TFTs) are considered to be irreplaceable devices for switching pixels of display panels. As the resolution of the display device being high, fast mobility with transparency is a essential requirements to improve the performance of TFTs.

Among the candidate materials for active layer in TFT, $CuIn_2O_2$ can be considered as a novel material due to the it's transparent conducting properties with a band gap value of 3.5-4eV. In addition, by the change of indium composition in $CuInO_2$, we can select the electrical conductivity with change of the n-type to p-type.[1] Moreover, the reported majority carrier mobility were very high that hole mobility in p-type is 4.97×10^2 cm^2/Vs to electron mobility in n-type is 4.7×10^2 cm^2/Vs indicating that $CuInO_2$[2] can be used as a active layer material for promising fast response properties. In this study, we fabricated the TFT with $CuInO_2$ based active layer with both conductivity. From the output characteristics of both TFT, we can confirm the change of electrical polarity of $CuInO_2$ by change of indium composition. In order to improve the device performance of TFT, we adopted graphene as a electrode for source and drain region as shown in Fig.1. The fabricated TFT with graphene electrode shows the superior conductivity than reference samples.

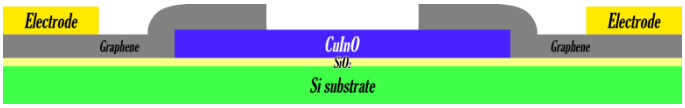

Fig. 1. Cross sectional schematic

We gathered I – V output curve of constructed device to ascertain the device operates as transistor. The curve shows characteristics of typical transistor. Also, the device has partial light transmittance to be used for increase light extraction efficiency of display panel.

References

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