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Study on the Seasoning Effect for Amorphous In-Ga-Zn-O Thin Film Transistors with Soluble Hybrid Passivation

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Oxide semiconductors such as zinc tin oxide (ZTO) or indium gallium zinc oxide (IGZO) have attracted a lot of research interest owing to their high potential for application as thin film transistors (TFTs) [1,2]. However, the instability of oxide TFTs remains as an obstacle to overcome for practical applications to electronic devices. Several studies have reported that the electrical characteristics of ZnO-based transistors are very sensitive to oxygen, hydrogen, and water [3,4,5]. To improve the reliability issue for the amorphous InGaZnO (a-IGZO) thin-film transistor, back channel passivation layer is essential for the long term bias stability.

In this study, we investigated the instability of amorphous indium-gallium-zinc-oxide (IGZO) thin film transistors (TFTs) by the back channel contaminations. The effect of back channel contaminations (humidity or oxygen) on oxide transistor is of importance because it might affect the transistor performance. To remove this environmental condition, we performed vacuum seasoning before the deposition of hybrid passivation layer and acquired improved stability. It was found that vacuum seasoning can remove the back channel contamination if a-IGZO film. Therefore, to achieve highly stable oxide TFTs we suggest that adsorbed chemical gas molecules have to be eliminated from the back-channel prior to forming the passivation layers.

References

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