A Study on the Impact of Thin Metal Films on Contact Resistance in IGZO FET

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Indium gallium zinc oxide (IGZO) is regarded as a highly promising material in semiconductor applications such as thin-film transistors (TFTs) and memory devices, due to its excellent properties, including low leakage current and high electron mobility [1,2]. However, there are still unresolved issues with IGZO, one of which is the high contact resistance between IGZO and source/drain electrodes, which significantly affects the performance of miniaturized transistor devices. Therefore, understanding and improving the contact resistance of IGZO is essential [3]. Various factors influence the contact resistance between IGZO and metals, but the metal's work function and the interaction between the metal and IGZO are particularly critical [4,5].

In this study, various thin metal films with a thickness of less than 5 nm were inserted between the electrodes and IGZO in transmission line model (TLM) devices to investigate the effect of metal oxide formation on contact resistance (fig.1). Based on these results, we analyzed how the metal's work function, oxidation tendency, and the band structure of metal oxides influence the contact properties with IGZO, and proposed strategies to effectively reduce contact resistance. These findings are expected to serve as valuable foundational data for improving the performance of various IGZO-based semiconductor devices.

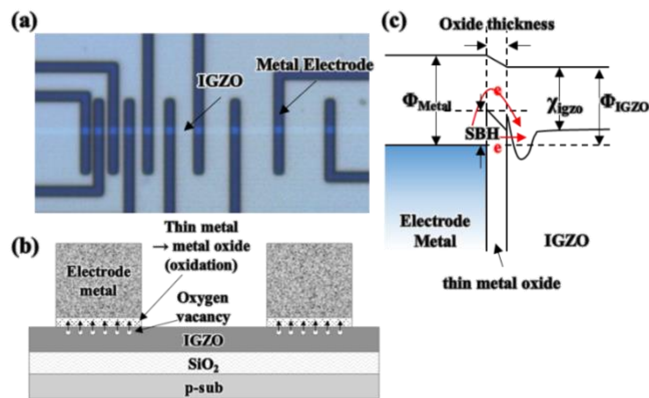

Figure 1. (a) top view, (b) vertical view TLM device, (c) band alignment induced by thin metal oxide formation

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