Reaction between Metal and Oxides

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Oxide semiconductor thin film transistors (TFTs) are widely used as switching devices in display technologies such as OLED (Organic Light Emitting Diode) and LCD (Liquid Crystal Display). The mobility of the oxide TFT is lower than that of the LTPS (Low Temperature Poly Silicon) TFT and is higher than that of the a-Si (amorphous silicon) TFT. And oxide TFT has an advantage of a low process cost compared to LTPS TFT. The metal contact to the semiconductor layer react each other to form metal oxide, which deteriorate TFT characteristics. Metal oxide formation has been reported as interfacial microstructure between a-IGZO and metal electrodes. Ti or Ti/Au electrode forms TiO_x interfacial layer and results in the increase of the contact resistance. Also, positive shift in V_{on} was observed by limitation of carrier injection due to barrier gap between oxide semiconductor and TiO_x. The Al_2O_3 and TiO_2 are also reported to cause a large contact resistance due to energy barrier at the contact interface. The interface reaction depends on process variables such as heat treatment temperature, time and environment. Therefore, the interfacial reaction between the metal electrode and the oxide semiconductor was investigated according to the anneal temperature, time and environment. After an a-IGZO layer is deposited on the ITO electrode, a metal electrode is deposited through a shadow mask on the a-IGZO layer. After annealing under various conditions, interfacial reaction was investigated.

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