TT-P044

Effects of Ta addition in Co-sputtering Process for Ta-doped Indium Tin Oxide Thin Film Transistors

박시내, 손대호, 김대환*, 강진규

대구경북과학기술원

Transparent oxide semiconductors have recently attracted much attention as channel layer materials due to advantageous electrical and optical characteristics such as high mobility, high stability, and good transparency. In addition, transparent oxide semiconductor can be fabricated at low temperature with a low production cost and it permits highly uniform devices such as large area displays. A variety of thin film transistors (TFTs) have been studied including ZnO, InZnO, and InGaZnO as the channel layer. Recently, there are many studies for substitution of Ga in InGaZnO TFTs due to their problem, such as stability of devices. In this work, new quaternary compound materials, tantalum-indium-tin oxide (TaInSnO) thin films were fabricated by using co-sputtering and used for the active channel layer in thin film transistors (TFTs). We deposited TaInSnO films in a mixed gas (O2+Ar) atmosphere by co-sputtering from Ta and ITO targets, respectively. The electric characteristics of TaInSnO TFTs and thin films were investigated according to the RF power applied to the Ta_2O_5 target. The addition of Ta elements could suppress the formation of oxygen vacancies because of the stronger oxidation tendency of Ta relative to that of In or Sn. Therefore the free carrier density decreased with increasing RF power of Ta_2O_5 in TaInSnO thin film. The optimized characteristics of TaInSnO TFT showed an on/off current ratio of 1.4 x 108, a threshold voltage of 2.91 V, a field-effect mobility of 2.37 cm2/Vs, and a subthreshold swing of 0.48 V/dec.

Keyword: Oxide thin film transistors