Al_2O_3 층을 이용한 저온공정에서의 산화물 기반 트랜지스터 컨택 특성 향상

Improved Contact property in low temperature process via Ultrathin Al_2O_3 layer

정성현[a,*], 신대영[b], 조형균[c]

[a*]성균관대학교 신소재공학부 (E-mail : wjdtjdgus2@skku.edu), [b]성균관대학교 신소재공학부, [c]성균관대학교 신소재공학부

초 록: Recently, amorphous oxides such as InGaZnO (IGZO) and InZnO (IZO) as a channel layer of an oxide TFT have been attracted by advantages such as high mobility, good uniformity, and high transparency. In order to apply such an amorphous oxide TFTs to a display, the stability in various environments must be ensured. In the InGaZnO which has been studied in the past, Ga elements act as a suppressor of oxygen vacancy and result in a decreased mobility at the same time. Previous studies have been showed that the InZnO, which does not contain Ga, can achieve high mobility, but has relatively poor stability under various instability environments.

In this study, the TFTs using IZO/Al_2O_3 double layer structure were studied. The introduction of an Al_2O_3 interlayer between source/drain and channel causes superior electrical characteristics and electrical stability as well as reduced contact resistance with optimally perfect ohmic contact.

For the IZO and Al_2O_3 bilayer structures, the IZO 30nm IZO channels were prepared at Ar : O_2 = 30 : 1 by sputtering and the Al_2O_3 interlayer were depostied with various thickness by ALD at 150°C. The optimal sample exhibits considerably good TFT performance with V_{th} of -3.3V and field effect mobility of 19.25cm^2/Vs, and reduced V_{th} shift under positive bias stress stability, compared to conventional IZO TFT.

The enhanced TFT performances are closely related to the nice ohmic contact properties coming from the defect passivation of the IZO surface inducing charge traps, and we will provide the detail mechanism and model via electrical analysis and transmission line method.