B-10

Low voltage operating ZnO thin-film transistors with Ni doped $BaSrTiO_3$ high-K gate insulator for transparent and mobile electronics

김정웅†, 김영웅, 최덕균, 김일두*, 홍재민*
한양대학교 신소재공학과; *KIST 광전자재료연구센터
(doogye98@ihanyang.ac.kr†)

Transparent ZnO based thin film transistors (TFTs) have received intensive interest due to their potential of replacing hydrogenated amorphous or polycrystalline silicon (a-Si:H or poly-Si) TFTs. Zinc oxide (ZnO) is a transparent compound semiconductor with a wide band gap (3.37 eV) which can be grown as a polycrystalline film at low or even room temperature. ZnO is, therefore, considered to be an ideal material for serving as the channel layer in transparent and flexible TFTs. As an important element, gate insulators for ZnO based TFTs have received increasing attention because ZnO-TFTs switching voltage can be reduced by using high-K gate dielectrics which can lead to high capacitance value. In this presentation, we report on the role of Ni doping in markedly reducing leakage currents in $Ba_{0.6}Sr_{0.4}TiO_3$ (BST) high-K gate insulator. Undoped and 1% Ni-doped BST thin films, deposited by rf magnetron sputtering at room temperature on $Pt/Ti/SiO_2/Si$ substrates, showed relative dielectric constants of ~20-25. 1% Ni-doped BST films exhibited leakage current densities below $1x10^{-7}$ A/cm^2 compared to the much higher value of $5x10^{-4}$ A/cm^2 characteristic of undoped BST films. ZnO based TFTs using 1% Ni-doped BST gate dielectrics exhibits low voltage operation less than 10 V with excellent saturation due to high dielectic constant of Ni-doped BST films. This work demonstrates that room temperature fabricated ZnO-based TFTs using 1% Ni-doped BST gate insulator will open up a promising route for the development of low voltage operating transparent and mobile electronics.

Keywords: Low operation voltage, ZnO-TFTs, Ni-doped BST

B-11

Dielectric Properties of Liquid Crystal Polymer(LCP) and CaTiO3-LaAlO3(CT-LA) Ceramic Composite

김진철, 김태경, 윤상준, 이화영, 박찬식*, 오준록†
(주)삼성전기 기술총괄 기판개발 Lab.; *(주)지믹스
(dr.jr.oh@samsung.com†)

We manufactured Liquid Crystal Polymer(LCP) and CaTiO3-LaAlO3(CT-LA) ceramic composites and investigated dielectric properties to replace LTCC substrate and apply to embedded capacitors. The dielectric properties of these composites are varied with volume fraction of CT-LA. Dielectric constant is in the range of 3~10. In addition, we could get Low TCC and High Q factor that could not achieve in another ceramic-polymer composites. The Q-value is 100~300 at 1GHz, and TCC is below ±300ppm/℃. We think that this material can be used high-Q substrate material like LTCC and embedded temperature compensation capacitor in Printed circuit boards.

Keywords: LCP, CaTiO3-LaAlO3(CT-LA), High Q, TCC