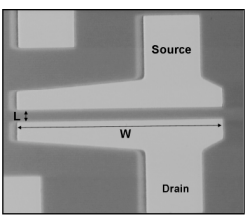
Photosensitivity of Amorphous InGaZnO Thin-Film Transistors

Tze-ching Fung, Chiao-shun Chuang, Kenji Nomura, Barry G. Mullins, and Jerzy Kanicki

Over the last several years, there has been a great interest in thin-film transistors (TFT) made of transparent amorphous $InGaZnO_4$ (a-IGZO) semiconductors. This is mainly due to its unique advantages such as visible light transparency, large-area uniform deposition at low temperature, and high carrier mobility. These attractive properties can potentially overcome all the drawbacks currently existing in conventional amorphous or poly-crystalline silicon TFT used for active-matrix flat-panel displays (AM-FPDs). In this project, we studied the photo-sensitivity of a-IGZO TFT and evaluated its feasibility to AM-FPDs.



We have fabricated inverted staggered a-IGZO TFTs and measured their electrical properties under monochromatic illumination. With the illumination wavelengths ranging from 460nm to 660nm, the TFT off-state drain current only slightly increases, while a large increase was observed for the wavelength below 400nm. Threshold voltage and sub-threshold swing are also only slightly modified between 460nm to 660nm, while field-effect mobility is unchanged in the investigated photo-energy range. The results are consistent with the a-IGZO optical energy band gap of about 3.05eV. Our study suggests that the a-IGZO TFTs are light sensitive only above 3.0eV and is suitable for a stable operation in AM-FPDs. This project is partially supported by the Defense Advanced Research Projects Agency and Applied Materials, Inc.