Fabrication of X-ray detector for real time image sensing with a-IGZO TFT

Hyoung-seok Choi[1], Myeong-ho Kim[1], Ji-hwan Jung[1] and Duck-kyun Choi[1]
[1]Dept. of Materials Science and Engineering, Hanyang University, Hangdang-dong, Seongdong-gu, Seoul 133-791, Korea
Tel.:82-2-2220-0506, E-mail: duck@hanyang.ac.kr

X-ray imaging technology has been used in a variety of fields, such as medical treatment, security system and engineering. In general, combining of thin film transistors (TFTs) array and X-ray detecting materials is considered as a crucial part of fabricating digital x-ray detector.

Up to date, amorphous silicon (a-Si) has been mainly used as an active layer material in TFTs, which act as a switching device in conventional digital X-ray detector. However, a-Si based X-ray detector panel TFTs have relatively low electron mobililty(< 0.5 cm^2/Vs) and driving speed, which leads to undesirable signal noise and degradades sensing speed and sensitivity of X-ray detector. Therefore, conventional a-Si TFT based X-ray detector requires large quantity of radiation for acquiring clear images and is not adequate for realizing real time images.

On the other hand, amorphous oxide semiconductor (AOS) is a well proven material in advanced display systems for its superior electrical performances compared to the a-Si. In particular, amorphous indium-gallium-zinc-oxide (a-IGZO) is known to be one of the most promising candidates for active layer material in oxide TFTs because of its high mobility (> 10 cm^2/Vs), good uniformity, low leakage current, high on/off ratio and room temperature process availability.

Nevertheless, the significant attack by hydrogen has been a serious barrier for substituting a-IGZO to a-Si, which is unavoidable during the integration process of the detector panel.

In this study, we will discuss about the way to minimize the hydrogen attack and demonstrate the successful fabrication of real time digital X-ray detector panel using a-IGZO TFTs and a-Si base photo diode.

References

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