# Wavelength-dependence of Persistent Photoconductivity in Zinc Oxynitride Thin-Film-Transistors

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Zinc oxynitride (ZnON) thin-film-transistor (TFT) having high mobility up to 110 $cm^2/V{\cdot}s$ is fascinating candidate as the next generation display device in active-matrix organic light-emitting diode and active matrix liquid crystal display panels in order to achieve the advanced display technologies such as 3-dimensional, high-resolution, and large size flat panel display [1-2]. Further, the ZnON TFTs are also suitable for application to optical sensor-embedded display because they have the properties of not only the high photoresponse but also the slight persistent photoconductivity (PPC) [3-4]. In spite of those merits, the wavelength-dependence (photon energy-dependence) of PPC the ZnON TFTs under photo-illumination has been seldom investigated.

In this work, we conduct the monochromatic photo-illumination stress with varying the photon energy ($E_{ph}$) in order to investigate the origin of PPC in the ZnON TFTs. It is observed that the higher photon energy causes not only the higher photocurrent during the illumination but also larger PPC which correlates with the negative threshold voltage shift and the subthreshold slope degradation after the photo-illumination [Fig. 1. (a), (b)]. Consequently, we find that the cause of the PPC is the donor creation near the conduction band edge during the illumination by tracking the subgap density-of-states (DOS) before and after the illumination [Fig. 1. (c)]. Our result is expected to be useful for developing the ZnON TFT-based future display applications.

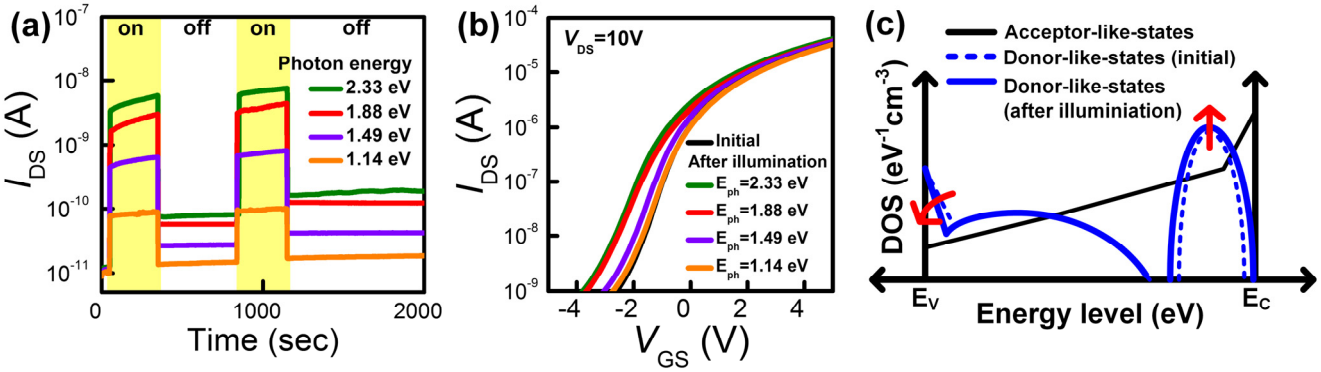


**Fig. 1.** (a) Photoresponse as real-time detection under cycle of dark and illumination (b) transfer curves before and after photo-illumination with varying the photon energy (c) schematic diagram about the donor creation

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