

Electronic supplementary information

Ultrahigh-sensitivity CdS photoconductor with instant response and ultralow power consumption for detection in low-light environments

Keng-Te Lin¹, Shao-Chin Tseng¹, Hsuen-Li Chen^{1*}, Yu-Sheng Lai^{2*}, Szu-Huang Chen², Yi-Chun Tseng¹, Ting-Wei Chu¹, Ming-Yu Lin³ and Yen-Pei Lu³

¹Department of Materials Science and Engineering, National Taiwan University, Taipei, Taiwan

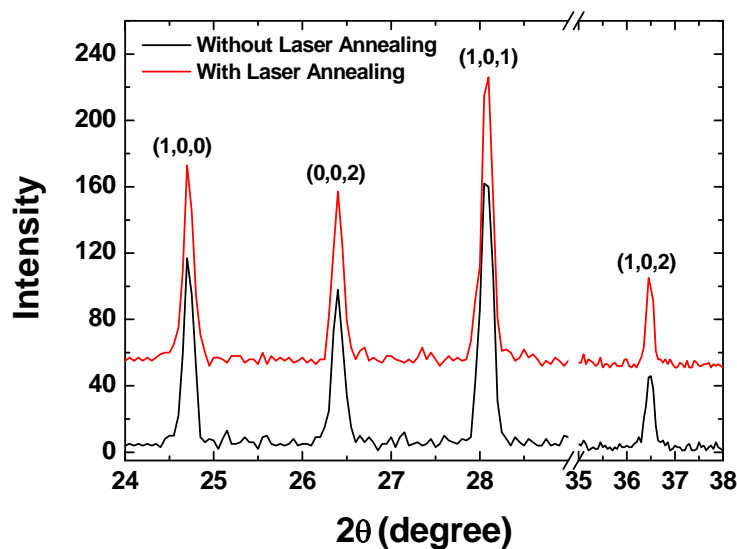
²National Nano Device Lab., Hsinchu, Taiwan

³Instrument Technology Research Center, Hsinchu, Taiwan

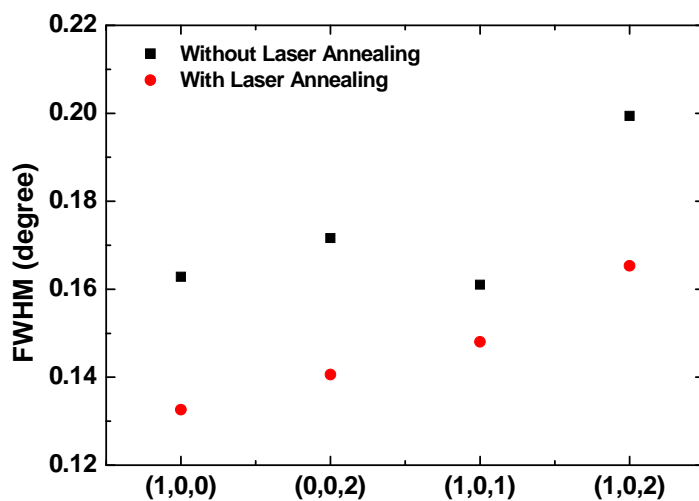
*Electronic-mail: *hsuenlichen@ntu.edu.tw

*yslai@ndl.org.tw

We used the X-ray diffraction (XRD) to characterize the CdS film before and after the KrF laser treatment. The results are shown in the following Figure S1. We found the diffraction peaks and intensities of the CdS film with and without the KrF laser treatment are similar. We further analyzed the full width at half maximum (FWHM) of the corresponding XRD bands to confirm the crystallization characteristics of CdS films. Because of the degree of crystallization was enhanced and the defect density was reduced in the annealed CdS films, as displayed in the Figure S1(b), the FWHM of XRD bands of the CdS film was decreased after the laser annealing process.



(a)



(b)

Fig. S1(a) The XRD measurement results of a CdS film with and without the KrF laser treatment. (b) The full width at half maximum (FWHM) of the corresponding XRD bands

We also measured the carrier mobility of CdS films before and after the KrF laser treatment to investigate the electrical properties of treated CdS devices. The measured results are shown in the following Figure S2. According to the measured results, the average carrier mobility of the treated CdS films performed tens times larger than that of the untreated one. Therefore, when the treated CdS devices illuminated by light, the excess carriers generated in the CdS films migrated with a lower level of carrier recombination, implying that the conductivity and photocurrent were also improved. In this study, the devices used for photodetection were commercial and very low-cost CdS photoconductors (ALLGUY; type number: 5001). Although, the variations of measured data for CdS devices were large. The measured results still reveal the average carrier mobility of laser-annealed CdS devices are obviously higher than that of untreated ones.

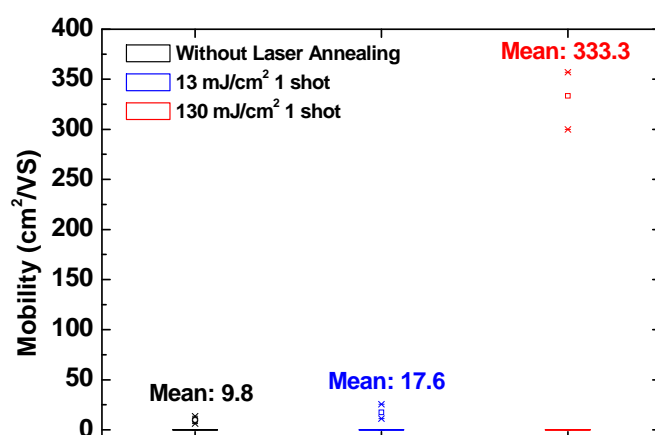


Figure S2 The carrier mobility of CdS films before and after the KrF laser treatment