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Scanning Photocurrent Imaging in CdS Nanosheets P. KUMAR, A. MAHARJAN, M. FICKENSCHER, H.E. JACKSON, L.M. SMITH, A. KOGAN, University of Cincinnati, J.M. YARRISON-RICE, Miami University, H. RHO, Y. LEE, Chonbuk National University, Y.J. CHOI, J. CHOI, J.G. PARK, Korea Institute of Science and Technology — We study photocurrent from photoexcitation of charged carriers in a CdS nanosheet (NS) at room temperature. Photolithography followed by Ti/Al (20nm/200nm) metal evaporation was used to fabricate Schottky type contact pads separated by $\sim$4 microns across a $\sim 3\mu$m wide single nanosheet. Dark current measurements and a model constructed using thermionic emission for the forward biased contact and thermionic field emission for the reverse biased contact is used to extract an intrinsic donor carrier density ($N_d \approx 10^{16}$ cm^{-3}), barrier height ($\phi_b \approx$ 0.8-0.9eV) and depletion layer ($\sim$400nm) for each device. Spatial imaging of the photocurrent exhibits peak photocurrents near the reverse bias contact confirming the confinement of the electric field within the space charge region due to the applied bias voltage. Photogenerated electrons and holes are collected at forward and reverse biased contacts, respectively. Polarization analysis shows that the photocurrent is maximized for laser excitation polarized perpendicular to the c-axis of the nanosheet. Supporte by the NSF (#0701703 and #0806700), Korea Research Foundation and KIST.

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