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Two-photon induced photocurrent imaging in CdS nanosheets[1]
P. KUMAR, A. WADE, H.E. JACKSON, L. M. SMITH , University of Cincinnati, J. YARRISON RICE, Miami University, YOUNG-JIN CHOI, JAE-GWAN PARK, Korea Institute of Science and Technology — We study the photocurrent from photoexcitation of charged carriers in CdS nanosheet (NS) structures at room temperature. Schottky type contact pads separated by ~ 4 μm across a ~ 4 μm wide single NS were fabricated using photolithography followed by Ti/Al (20 nm/200 nm) metal evaporation and lift-off. Ar^+ bombardment before the metal deposition was used to create Ohmic contacts. For Schottky type contacts, spatial imaging of the photocurrent exhibits peak photocurrents near the reversed bias contact confirming the confinement of the electric field within the space charge region due to the applied bias voltage. For devices with the Ar^+ bombarded contacts, we observe the peak photocurrent distinctly away from the contacts. We find a nearly quadratic power dependence of photocurrent in the laser power range $\sim$0.1-10 GW/cm^2 for sub band gap excitation ($\lambda = 800$ nm), while linear power dependence of photocurrent for above band gap excitation ($\lambda = 488$ nm). Simple model calculations are used to obtain a two-photon absorption coefficient β $\sim$100 cm/GW in these CdS nanosheets.

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