Scanning Photocurrent Microscopy on Single-Layer CVD MoS2, MoSe2, and Alloys

EDWIN PRECIADO, VELVETH KLEE, DAVID BARROSO, Univ of California - Riverside, KRISTOPHER ERICKSON, Sandia NL, MARK TRIPLETT, Univ of California - Davis, ARIANA NGUYEN, CHRIS LEE, I-HSI LU, SARAH BOBEK, JOHN MANN, Univ of California - Riverside, ALEC TALIN, FRANCOIS LEONARD, Sandia NL, LUDWIG BARTELS, Univ of California - Riverside — We report scanning photocurrent measurements on CVD-grown single-layer films of MoS2, MoSe2, and MoS2(1-x)Se2x alloys. Measurements at different irradiation intensity reveal a superlinear photoresponse irrespective of the material composition. We find photocurrents that decrease and IV-behavior that becomes more linear with increasing selenium contents. Measurements in dependence of the channel width indicate carrier diffusion length on the order of 0.9 micron for MoS2 and 0.5 micron for MoSe2. Concomitant thermal imaging rule out thermal defects. Time-dependent measurements suggest long-lived traps for MoS2 based materials that are absent for MoSe2-based materials.