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Internal quantum efficiency measurements of wafer-scale CVD grown MoS_2 phototransistors MAXWELL WOODY, JOHN ROBERTSON, XUE LIU, JIANG WEI, MATTHEW ESCARRA, Tulane Univ — Here we perform photocurrent measurements on wafer-scale monolayer and few-layer CVD MoS_2 to demonstrate the optoelectronic capabilities of large-scale MoS_2 growth. The MoS_2 films were grown on SiO_2-on-silicon substrates using a Mo-precursor thermal vapor sulfurization technique and used to make back-gated field effect phototransistors. Light from a tunable supercontinuum laser was focused on the devices, while gate or source-drain voltages were varied. Photocurrent spectra of bilayer MoS_2 as a function of incident wavelength displays the characteristic A(673nm), B(620nm), and C(438nm) excitons commonly associated with MoS_2. By measuring the power of the laser at each wavelength, the external quantum efficiency (EQE) of the device is calculated. The results show a clear band edge at 690nm and corresponding in-band EQE ranging from 1-3%. Internal quantum efficiency (IQE) will be found using absorption data, and optical responsivity will be calculated for different thicknesses of grown MoS_2. These results show progress toward MoS_2 photodetectors from wafer-scale 2D semiconductors and provide a path toward large area MoS_2 to be used as a photovoltaic material. Future experiments intend to synthesize photovoltaic architectures from these materials.

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