Plasmonic Hot Electron Induced Photocurrent Response at MoS$_2$-Metal Junctions

TU HONG, Vanderbilt University, BHIM CHAMLAGAIN, Wayne State University, SHUREN HU, SHARON WEISS, Vanderbilt University, ZHIXIAN ZHOU, Wayne State University, YAOQIONG XU, Vanderbilt University — We investigate the photocurrent generation mechanisms at few-layer MoS$_2$-metal junctions through wavelength- and polarization-dependent scanning photocurrent measurements. When laser energy is above the direct bandgap of MoS$_2$, the maximum photocurrent response is observed when incident laser polarization direction is parallel to the metal electrode due to photovoltaic effect. On the contrary, when illuminated by laser with energy below the direct bandgap of MoS$_2$, the strongest photocurrent response occurs when incident laser is polarized perpendicular to the metal electrode. Further studies demonstrate that light absorption by the plasmonic metal electrode is polarization-dependent, which creates hot electron-hole pairs and subsequently inject into MoS$_2$. These studies shed light on future design rules of two-dimensional material based optoelectronic devices through surface plasmon resonances.

Tu Hong
Vanderbilt Univ

Date submitted: 04 Nov 2015

Electronic form version 1.4