Enhancement of photocurrent on few-layered $p$-WSe$_2$ FET by multi-terminal measurement\textsuperscript{1} CARLOS GARCIA, Florida State University/NHMFL, NIHAR PRADHAN, NHMFL, JOSHUA HOLLEMAN, DANIEL RHODES, Florida State University/NHMFL, LUIS BALICAS, STEPHEN MCGILL, NHMFL — Recently, two dimensional materials particularly transition metal dichalcogenides (TMDs) have been extensively studied because of their strong light-matter interactions and extraordinary electrical and optical properties in field-effect transistors (FETs). We investigated the photocurrent response on few-layered $p$-WSe$_2$ and MoSe$_2$ FETs in a multi-terminal configuration using a 532 nm laser. Photogenerated current $I_{\text{ph}} (= I_{\text{light}} - I_{\text{dark}})$ was measured as a function of optical power incident on the sample with varying source-drain bias, $V_{\text{ds}}$, and back gate voltage, $V_{\text{bg}}$. We observed a large enhancement of photocurrent in a four-terminal configuration compared to a two-terminal configuration. The measured two-terminal photoresponsivity ($R$) and external quantum efficiency ($EQE$) from our $\sim$10 layers $p$-WSe$_2$ at applied $V_{\text{ds}} = 1$V and $V_{\text{bg}} = 10$V were $\sim$18A/W and $\sim$4000%, respectively. The $R$ and $EQE$ values increased to $\sim$85 A/W and $\sim$20000% respectively using a four-terminal configuration. Thus by using a multi-terminal configuration, one can observe an enhanced photocurrent response on few-layered TMDs for potential applications in photo-detection and optoelectronic circuits.

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