# Gate tuning of polarization of anisotropic excitons in $ReS_2$

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Anisotropic two-dimensional materials provide promising platforms for polarization-driven optoelectronic and photonic devices. In particular, $ReS_2$ offers rich anisotropic electrical and optical properties due to low symmetry triclinic structure. Due to in plane anisotropy, the photoluminescence of $ReS_2$ is dominated by excitons with different polarization orientation. Herein, we have studied the polarization resolved and gate voltage dependent photoluminescence (PL) from few layer $ReS_2$ at cryogenic temperature (5K). The relative oscillator strength of two excitons of $ReS_2$ is tuned by changing the detection polarization and we are able to see the relative orientation of two dipole ~ 60° as shown in Figure 1 (a). With the rotation of polarizer the relative intensity of two excitons gradually change such that at particular polarization angles only one ($X_1$ or $X_2$) exciton is dominating over another. We observed that same effect as rotation of polarization can be accomplished by using the back gate voltage with un-polarized detection of PL as shown in Figure 1 (b). At a particular gate bias, one of the exciton ($X_1$) is quenched and the PL from $ReS_2$ becomes highly directional. This tuning of polarization using gate voltage, opens up avenue for on demand polarization of emitted light.

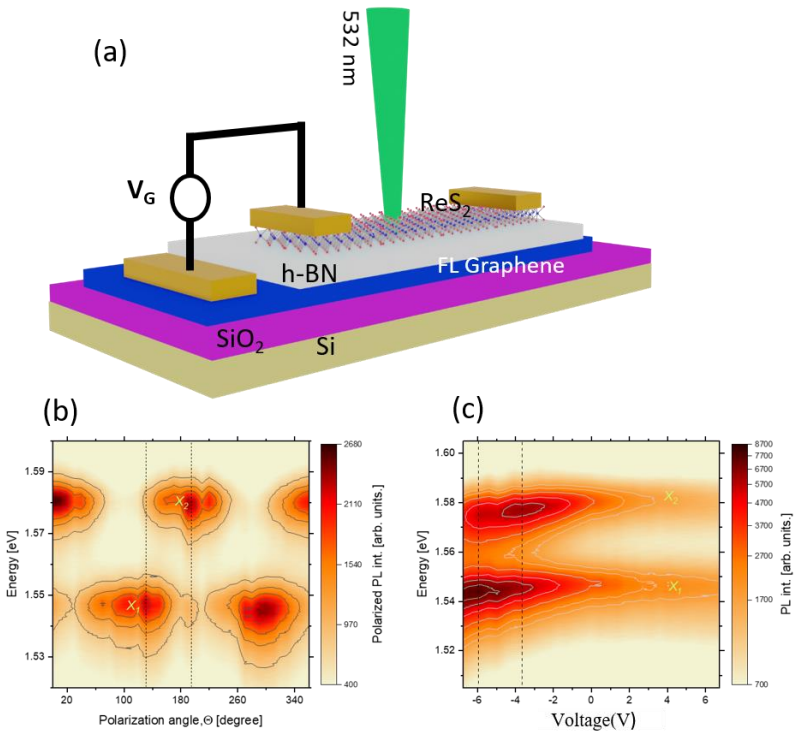


Figure 1 (a) Schematic of device used for gate voltage dependent polarization studies of $ReS_2$. (b) Polarization dependent PL of $ReS_2$ at 5K. (b) Gate tunable PL of $ReS_2$ shows that at large negative bias, $X_1$ quenches and emission becomes dominated by $X_2$