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Optical and electrical responses of optically excited single layer MoS_2 depending on the carrier concentration SEONG CHU LIM, JINHEE LEE, JUNGHO KIM, HOMIN CHOI, JAESOO KIM, JUNGJOON BAE, MOHAN KUMAR, Department of Energy Science, Center for Integrated Nanostructure Physics, Sungkyunkwan University, Suwon, Republic of Korea — In this work, we study both optical and electrical responses of a single layer molybdenum disulfide (MoS_2) connecting source and drain electrodes deposited on SiO_2 layer. Depending on the gate bias, the incremental rate of the photocurrent is different, implying the carrier concentration is closely involved with the observations. In semiconducting state at high negative gate bias, the increase of the number of carriers is more influential on electrical conductivity of MoS_2, whereas in metallic state at high positive gate bias, the electron-electron scattering is more dominant. In addition, the photoluminescence (PL) is significantly affected by the carrier concentration as well. At low concentration, PL is stronger than that of at higher carrier concentration that weakens Coulomb interaction between electron-hole pairs.

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