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Light enhancement due to Coulomb catalysis in hybrid Molybdenum Disulfide YUBA POUDEL, ARUP NEOGI, Univ of North Texas — Bulk molybdenum disulfide (MoS_2) material has an indirect bandgap semiconductor and does not normally emit light. Reducing the thickness to a few monolayer modifies the bandstructure of MoS_2 to a direct bandgap and results in light emission. However, the light emission from a single monolayer is usually weak due to the relatively low absorption cross-section that a single monolayer provides. Thereby there has been efforts to use metal nanoparticles (NPs) for increasing the light emission efficiency of a single monolayer MoS_2 due to localized plasmon (LSP) interaction with excitons. The localized plasmons due to metal NPs when tuned to the emission energy of the MoS_2 exciton emission can increase the radiative recombination rate or hot carrier effects and lead to enhanced PL emission. However, the resonant interaction of emitted light with the LSP is dissipative. To avoid dissipative effects of metal nanoparticles, off-resonant LSP interaction due to metal is used for light enhancement. Electrostatic image charge effect has led to significant enhancement in GaN, GaAs, ZnO and graphene oxide system. In this work we demonstrate the PL enhancement from MoS_2 coupled to Ag NPs. The electrostatic basis of light enhancement is confirmed using time and temperature dependent PL measurements.

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