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Effects of Metal Nanoparticles on Optical Behavior Tunability of Multi-layer MoS_2 SHERMIN ARAB, STEPHEN CRONIN, University of Southern California — We investigate the effects of metal nanoparticles (NP) on tunability of the optical response from relatively thick MoS_2 flakes. The plasmonic interactions and charge transfer at the metal-semiconductor interface is studied through metal NP deposition on mechanically exfoliated MoS_2. The optical quenching effect of metal NP capping is observed. Our photoluminescence results show that the surface charge transfer at the metal-semiconductor interface and creation of possible defect points at the semiconductor surface can lead to quenching of the photoluminescence response. Our optical observation of thicker MoS_2 flakes shows that, by using a metal NP capping layer, one can selectively exclude photoluminescence response from the peak due to indirect transition. This approach provides a controlled method for tuning the optical response of relatively thick MoS_2 flakes. In this study the effects of Au, Cu and Ag NPs are investigated. Micro-PL spectroscopy of the MoS_2 flakes is performed; where, PL spectra are collected in the 1.2 eV to 2.3 eV energy range and a 532 nm CW laser is used for excitation. X-ray photoelectron spectroscopy (XPS) is performed to investigate the nature of the metal-semiconductor interface.

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