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Influence of Au Nanoparticles and Gas Adsorption on Transport Behaviors of MoS2 Layers YUNAE CHO, AHRUM SOHN, SUJUNG KIM, DONG-WOOK KIM, EWHA Woman's Univ, BYUNGJIN CHO, Korea Institute of Materals Science, MYUNG GWAN HAHM, Inha University, DONG-HO KIM, Korea Institute of Materals Science — Chemical vapor deposition (CVD) techniques can provide large-area wafer-scale MoS2 thin films, which are very useful for electronic and optoelectronic device applications. Control of the carrier concentration and doping type of MoS2 is crucial for its application in electronic and optoelectronic devices. The electrical properties of atomically thin MoS2 layers are very sensitive to ambient gas adsorption and coating of metal nanoparticles (NPs). In this work, we studied the relationship between the resistance (R) and surface work function (WF) of CVD-grown MoS2 layers with and without Au NPs while varying the gas (N2, O2, and H2/N2) environment. The ambient gas largely varied the WF but could not cause measurable R change for both the bare and NP-coated samples. Temperature-dependent transport suggests that variable range hopping is the dominant mechanism for electrical conduction in the MoS2 layers. The charges transferred from the gas adsorbates might be insufficient to change R and/or be trapped in the defect states. The smaller WF and larger localization length of the NP-coated sample, compared with the bare sample, suggest that more carriers and less defects enhanced the electrical conduction in MoS2.

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