ABSTRACT

Two-dimensional (2D) layered materials such as dichalcogenide transition metals (TMDC) which stack together and formvan der Waals heterostructures create interesting phenomena due to their interlayer interactions. They also have great potential to produce atomic-scale devices in the order of a nanometer. Despite these interesting phenomena, there are still many challenges faced such as the difficulty of controlling manufacturing, reproducibility, the alignment of the band, and the lattice mismatch. Besides, the fundamental understanding of the interlayer effect between layers are still open for investigation. In this final project, the electrical characterization of WS_2/MoS_2 heterostructures are investigated by observing the I-V characteristic curve. The potential of WS_2/MoS_2 heterostructures for charge storage is also studied by conducting cyclic voltammetry (CV) measurement. The WS_2/MoS_2 heterostructures deposited on polyethylene terephthalate (PET) show various characteristics including p-n junction- and insulating like behaviors. The sulfur vacancies inducing charge trapping are indicated by the hysteresis in I-V curves. At a scan rate of 10 mV/s, the cyclic voltammetry measurement revealed the highest specific capacitance of 39,9 m*F/g, which is shown by single drop exfoliated WS_2/MoS_2 samples. On the other hand, a highest specific capacitance of 1.21 mF / cm^2 is shown by a multiple drop exfoliated WS_2/MoS_2 samples. This observation indicates the process of layers restacting that form a 3-dimensional structure during fabrication process. However, the charge adsorption and storage might occur effectively only at the outer layer. This study is expected to provide information for further investigation of nanoscale electronics, charge-storage devices, and flexible electronics.*

Keywords: WS_2/MoS_2 heterostructure, electrical properties, charge storage, cyclic voltammetry (CV).