

ABSTRACT

The research is aimed to observe the layer distribution and to study the electrical properties of the Tungsten Disulfide (WS₂) deposited on various substrates. 1 mg/mL WS₂ was modified with 2 mg/mL NaOH and 10 mL NMP using liquid phase exfoliation method. The WS₂ liquid colour changes with the increasing time of sonication process. It indicates the exfoliation process. From transmission measurement, it was observed that the exfoliated WS₂ spectra experiences a blue shift compared to the non exfoliation one. Modified WS₂ liquid absorbed light at wavelength of 528 nm while the non exfoliation absorb light at wavelength of 564 nm. A clear emission centered at wavelength of 741 nm was observed for exfoliated sample, whereas it was at wavelength of 880 nm for non exfoliated one. The WS₂ layers on top of PET substrate were distributed more uniform compared to the ones on the ITO/PET and SiO₂ substrates. The formed layers on PET and ITO/PET substrate have average thickness of 12 and 7 nm, respectively. WS₂ layer on PET and ITO/PET substrate absorbed light at wavelength of 600 – 650 nm with absorption peak at wavelength of 600 nm. Characterization of electrical properties was done by observing I-V curve. The current generated by the WS₂ layer on the PET substrate was – 0,78 nA to 1,06 nA when voltage was varied from -10 V to 10 V with $V_{th} = 4,037$ V and the resistivity of 0,105 GΩ.μm. The current generated by the WS₂ layer on the SiO₂ substrate was – 9,105 μA to 3,59 μA when voltage was varied from -5 V to 5 V with $V_{th} = 3,03$ V and the resistivity of 0,8 MΩ.μm. The WS₂ layers on top of ITO/PET substrate could not be characterized by its electrical properties because ITO/PET conductivity was dominant.

Keywords: WS₂, SiO₂, PET, ITO/PET, Exfoliation, Electrical Properties