Physical characterization of spin-coated MoS_2 films

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In the field of Transition Metal Dichalcogenides (TMDCs), molybdenum disulfide (MoS_2) has attracted an outstanding interest due to several applications. MoS_2 has potentialities not yet fully realized in solution-based applications. However, the lack of knowledge of the optical properties of MoS_2, especially in the infrared range, has significantly limited his use in many exciting photonic fields. In this work, the broadband optical properties of MoS_2 films deposited by spin-coating onto Si/SiO_2 substrates were studied by means of Variable Angle Spectroscopic Ellipsometry (VASE).
The morphological and the structural properties of the samples were investigated by Scanning Electron Microscopy (SEM), Atomic Force Microscopy (AFM) and Micro-Raman Spectroscopy.
Micro-Raman spectroscopy measurements reveal the presence of 2H-MoS_2 and 1T-MoS_2 phases. The optical properties of the films show a mid-gap state at~ 0.6 eV, not reported in an ellipsometry work before, induced by defects in the MoS_2 samples.

References

[1] Chen et al, Solid State Commun. 14 (1974) 857–860
[2] Reshmi et al , Nanotechnology. 29 (2018) 205604
[3] Salehi et al, A, Surf. Sci. 651 (2016) 215–221
[4] C. Yim et al, Appl. Phys. Lett. 104 (2014) 103114

Figures

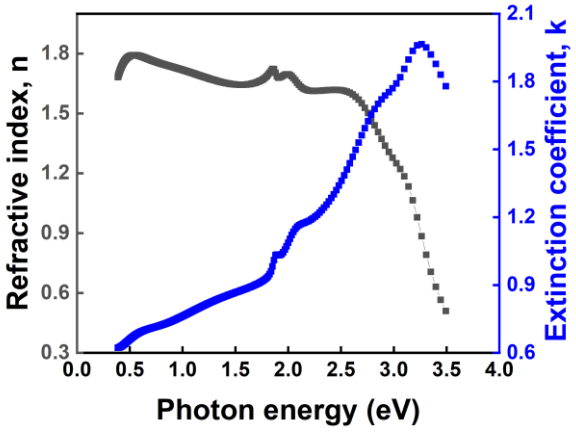

Figure 1: Estimated dispersion laws of MoS_2 films spin-coated onto Si/SiO_2 substrates by Variable Angle Spectroscopic Ellipsometry characterization.