DEPOSITION BY DROP CASTING AND CHARACTERIZATION OF MOS_2 NANOPLATELETS ON FTO/GLASS SUBSTRATES

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MoS_2 can be arranged as a 2D material characterized by strong (covalent) in-plane bonds and weak (Van Der Waals) interactions between the layers. It received much interest due to its advantageous properties, in specific for the modification from indirect (bulk) to direct (monolayer) of its bandgap and its exceptional carrier mobility. This work focuses on developing synthesis strategies to deposit MoS_2 at low temperatures and optimize the surface coverage of FTO/Glass, for solar cell applications [1]. For the deposition, MoS_2 nanoplatelets dispersed in water and ethanol solution were purified through multiple centrifugations and sonication, deposited by drop-casting method on the FTO/Glass surface, and annealed at 260°C for 30 minutes in air. The samples were characterized before and after annealing by Photoluminescence (PL), Raman spectroscopy, and optical measurements, evaluating the reflectance, transmittance, and absorbance spectra in the UV/Visible range. The Raman spectrum of MoS_2, contains two major peaks, 381 nm (E_{2g}) and 406 nm (A_{1g}), which represent the in-plane vibration and out-of-plane vibration of the molecules, respectively [2]. The thickness of the deposited MoS_2 has been measured by scanning electron microscopy (SEM), obtaining a value of about 7 nm, corresponding to about 8 monolayers. As a result of the thermal treatment, the PL emission was enhanced which can be attributed to two factors: the formation of Mo-O bonds during annealing and the localized electrons formed around the Mo-O bonds [3]. The interplay between Mo oxidation and PL intensity is discussed.

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