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Molybdenum disulfide/ sodium dodecyl sulfate thin films deposited on APTES functionalized silicon using electrophoretic deposition.

Abstract:

Molybdenum disulfide (MoS_2) and other transition metal dichalcogenides (TMDCs) have been the subject of increasing research due to their optical, catalytic, and gas sensing properties. This report presents the fabrication of MoS_2/ sodium dodecyl sulfide (SDS) thin films onto 3-aminopropyl-triethoxysilane (APTES) functionalized semiconductor (silicon) substrates by electrophoretic deposition (EPD). The addition of the anionic surfactant SDS to the MoS_2 aqueous solution increases the zeta potential of the particles and consequently increases the stability of the solution. Increase in zeta potential and solution stability result in less agglomeration and therefore higher quality depositions while using EPD. The use of SDS within the MoS_2 solution also improves the quality of the colloidal suspension. In this talk, we will present how the MoS_2/ SDS solutions used in this work facilitated significant improvement in the resultant EPD driven thin films compared to depositions without SDS. The characterization of these samples with Raman and 4-point probe was used to identify the material quality and conductivity. Our results are indicative of how EPD may be scaled to provide an economical, quick, and room temperature solution-based fabrication method for MoS_2 thin films that, in turn, may be combined during deposition with semiconducting materials.