Liquid Exfoliation of Ultrathin Electronic Grade Tin (II) Sulfide (SnS)

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Recently, earth abundant orthorhombic tin (II) monosulfide (SnS) has sparked as a rising star material due to its intriguing optical, electrical, and mechanical properties. [1-3] However, the synthesis of chemically stable, electronic grade, few- to monolayers of SnS has been significantly challenged due to its strong interlayer forces originates from active lone pair electrons. [4] Here, we present a systematic investigation to synthesize large area, ultrathin (as thin as two of monolayers) SnS sheets (**Figure 1**) through a sonication assisted liquid phase exfoliation (LPE). The solvent chemistry was used to understand the LPE. The LPE SnS nanosheets were confirmed by the microscopic and spectroscopic techniques. The ultrathin layer of SnS were exhibited highly crystalline in nature. [5] The thin layer of SnS nanosheets exhibits an ultrasensitive in UV light detection (λ~254 nm) with first response and recovery time (**Figure 2**). Further, the SnS nanosheets were employed as an interface- /inter- layer of a functional perovskite solar cells to enhance selective charge collection and environmental device stability.

References

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Figures

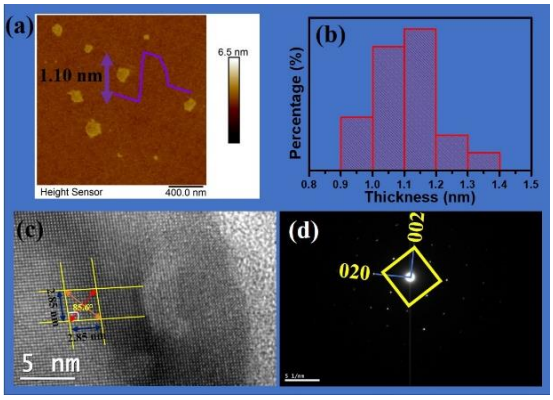

Figure 1: Microscopic characterization of layered SnS nanosheets. (a) atomic force microscopy (b) thickness histogram, (c) HR-TEM, and (d) SAED pattern.

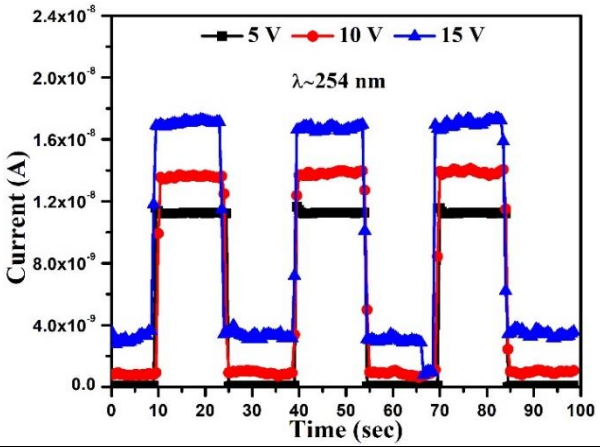

Figure 2: Voltage dependent photoresponse characteristics of bi-layer SnS under UV light (λ~254 nm) illumination.