Synthesis of 2D Tin-Sulfide Nanosheets Through Liquid Phase Exfoliation

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Successful isolation of 2D materials beyond graphene, such as 2D tin monosulfide (SnS), opens a new horizon in material research because unlike graphene, SnS is a semiconductor. The cost-effective and large-scale production of SnS nanosheets is a fundamentally important step to realize its applications. The exfoliation of nanosheets in a solution from their bulk counterpart using high-intensity ultrasound waves has proven to be an effective method. Here, we compare the liquid phase exfoliation of SnS nanosheets in isopropyl alcohol and water. We show nanosheets' yield in both solvents significantly increases if the bulk SnS is manually ground prior to the ultrasonication process. The optical measurements show the nanosheets produced are high in quality, whereas the atomic force microscopy measurements suggest SnS is exfoliated into individual layers. Furthermore, it is found that SnS is successfully exfoliated using water, although less effective in creating a large quantity of quality nanosheets. The efficient exfoliation of SnS in an environmentally friendly and low-boiling-point solvent like in water would be advantageous for applications, and therefore should be explored more.

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