Modified Successive Ionic Layer and Adsorption Reaction (SILAR) to introduce Vertically grown SnS nanosheets

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We describe a modified Successive Ionic Layer and Adsorption Reaction (SILAR) technique **(Figure 1)** for the controlled production of vertically developed SnS nanosheets over a large substrate surface (16 cm^2). The enhancement entails fine-tuning the SILAR settings to gain improved control over the growth process, allowing the creation of well-defined and vertically aligned SnS nanosheets.

X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and X-ray Photoelectron Spectroscopy (XPS) were used to analyze the developed nanomaterials. The crystalline nature of the vertically developed SnS nanosheets was shown by XRD examination, with distinct peaks corresponding to the orthorhombic phase of tin sulfide. The nanosheets' large-area coverage and vertically grown nature were highlighted by SEM imaging, offering unique insights into their shape and structure.

A further microscopic study using TEM revealed the detailed structural elements of the nanosheets, confirming their sheet-like topography, fringe spacing, and crystallinity nature. The XPS examination revealed elemental composition and chemical state information, offering insight into the surface chemistry of the produced SnS nanosheets.

The modified SILAR approach presented here not only enables large-scale development of SnS nanosheets but also provides a route for modifying their structural and morphological features. The extensive characterization of the produced nanomaterials using XRD, SEM, TEM, and XPS methods offers a detailed knowledge of them, making them interesting candidates for use in optoelectronic devices, energy storage systems, and catalysis. This study advances controlled nanomaterial manufacturing and broadens the possible uses of SnS nanosheets in a variety of technical sectors.

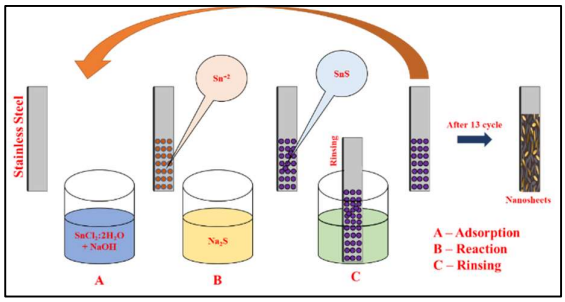

Figure 1: Schematic illustration of Vertically grown SnS nanosheets.