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**Challenging Natural Order: 2D Non-Layered Chalcogenide Nanomaterials for Renewable Energy Applications**

## ABSTRACT

Nanoscale precursors have been found useful in preparation of functional thin films for a variety of applications, from biosensors to solar photovoltaics. The advent of graphene, exhibiting exotic electronic properties, lead to a considerable interest in two-dimensional (2D) nanoscale materials. While graphene behaves as a zero-band-gap semiconductor, the plethora of 2D inorganic materials in the metal chalcogenides family could act as insulators, semiconductors or superconductors. A major advantage of the 2D materials is their amenability to thin film deposition on flexible substrates and it is envisioned that they will revolutionize diverse applications such as optoelectronics, valleytronics, photovoltaics, as well as energy conversion and storage. When endowed with adequate functionality, 2D nanostructured chalcogenides are readily dispersible in various solvents to create colloidal solutions. Such dispersions, often called inks, could be easily coated in large areas on conducting substrates, conferring an inexpensive and robust method to construct thin films. The processing required for obtaining uniform and dense nanostructured coatings is governed by the ability to tailor particle size, particle size distribution, nanoprecursors' surface and to select appropriate dispersion reagents. Each type of nanostructure is unique and finding a specific set of conditions require in-depth analysis of properties such as surface identity and morphology.

The presentation will cover our discoveries in thin-film 2D chalcogenide nanomaterials and their application.