

New Horizons in Coatings and Thin Films Room Town & Country C - Session F3-FrM

2D Materials: Synthesis, Characterization, and Applications

Moderator: Suneel Kodambaka, University of California Los Angeles, USA

8:00am **F3-FrM-1 Tackling Scalability in the Synthesis of Two Dimensional Chalcogenide Semiconductors and their Heterostructures**, *Nicholas Glavin (nicholas.glavin.1@us.af.mil)*, Air Force Research Laboratory, USA **INVITED**

The rapid development of 5G communications, wearables, sensors, and internet of things have pushed forward the need for all types of electronics and sensors requiring the exceptional properties of two-dimensional (2D) nanomaterials. Graphene and other 2D materials have become an increasingly interesting candidate in these systems due to the mechanical strength and flexibility at the ultimate materials scaling limit, unique transport characteristics, tunable optical properties, controllable surface sites and the potential for facile device fabrication. In this talk, challenges and opportunities to address scalability in 2D material transition metal dichalcogenides is presented. These techniques include low cost and customizable laser-manufacturing approaches and a two-step metal conversion process for direct synthesis of superlattices to allow material properties by design.

8:40am **F3-FrM-3 2D Nanosheets Exfoliation and Functionalization from Hexagonal Boron Nitride in Aqueous Phase for Ultrafast Solvent Transport of Molecular Solute Screening Film**, *Degu Lere Keshebo (keshebos@gmail.com)*, C. HU, J. Lai, National Taiwan University of Science and Technology, Taiwan

Currently hexagonal boron nitride is promising materials for its solidity in different working conditions but preparation based on environmental friendly technique is challenging. In this study, aqueous phase exfoliation using tannic acid has demonstrated an easy, novel, green method used to prepare functionalized boron nitride nanosheets. Both microscopic techniques (TEM, SEM AFM) and spectroscopic techniques (XRD, XPS, FTIR, and Raman) were used to characterize the exfoliated nanosheets and synthesized membrane. Tannic acid is adsorbed on hexagonal boron nitride surface and gradually exfoliating in the form of a few layers of functionalized boron nitride nanosheets, it behaves as a green surfactant by weakening the interlayer interaction. Ultimately, the functionalized exfoliated nanosheets used to prepare membrane for environmental applications. Fascinatingly, the prepared membrane is an exceedingly stable in water and other organic solvents and shows good efficiency in transporting solvents with excellent screening of solutes with long-term antifouling. The synthesized membrane's rapid transport rate of solvents and good separation efficiency of solutes can be due to robust nanochannel and thin laminar networks of nanosheets, which afford beneficial properties for the membrane effective separation and purification processes.

Keywords: hexagonal boron nitride, 2D nanosheets, tannic acid, noncovalent functionalization, antifouling, molecular sieving

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