

Opportunities and Challenges of Complex Oxide Membranes

Bharat Jalan

Department of Chemical Engineering and Materials Science, University of Minnesota –
Twin Cities, Minneapolis, MN 55455, USA

In this presentation, I will discuss the challenges involved in synthesizing three-dimensional (3D) perovskite nanomembranes and the innovative approaches our group has developed to overcome these obstacles. Utilizing hybrid molecular beam epitaxy (MBE) with a metal-organic precursor, titanium isopropoxide, we successfully grew epitaxial SrTiO_3 (STO) and BaTiO_3 (BTO) films directly on graphene layers that were transferred onto bulk STO substrates. These films were then exfoliated and transferred onto various other substrates. Additionally, I will showcase a sacrificial layer method that enables the creation of oxide membranes with a room temperature dielectric constant of approximately 300. The talk will conclude with an exploration of the potential applications of 3D nanomembranes in materials physics and device engineering.