

# Novel MBE Approaches for Atomically-Precise Synthesis of “Stubborn” Metals and Metal Oxides

seminar

May 6, 2021 4:30 pm  
Zoom Lecture

  
NANO-SYSTEMS FROM IONS,  
SPINS AND ELECTRONS

## Abstract

Our ability to synthesize atomically-precise materials has continued to drive modern technology and fundamental study. Consider an element of periodic table that is hard to oxidize and also difficult to evaporate, how do we then perform a controlled synthesis of atomically precise thin films of such metals, metal oxides or their heterostructures? This has been a central question in the synthesis science for many decades.

In this talk, I will present my group's effort to address this question. We have recently shown that both the low vapor pressure and difficulty in oxidizing a “stubborn” element can be addressed by using a solid metal-organic compound with significantly higher vapor pressure, and with the added benefits of being in a pre-oxidized oxidation state along with excellent thermal and air stability. Using this approach, we show, for the first time, the synthesis of Pt, RuO<sub>2</sub> and SrRuO<sub>3</sub> films with the same ease and control as afforded by III-V MBE.

I will present a detailed MBE growth study combined with structural and transport characterizations. The effect of film thickness, orientation, strain, and defects such as cation vacancies on electronic properties will be discussed. In second part of my talk, I will present our work on the development of radical-based MBE approach for alkaline stannate (BaSnO<sub>3</sub> and SrSnO<sub>3</sub>) growth combined with detailed structure and transport study.

## Speaker

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