Spring 2018 Joint Colloquium
Materials Department & Materials Research Laboratory

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Dept. of Chemical Engineering & Materials Science
University of Minnesota

Friday, May 11th, 2018
11:00 am, ESB 1001

MBE Growth, Structure, Defects and Transport in High-Mobility Stannate Films

In this talk, I will review the grand challenges of the synthesis of metal oxides thin films containing elements of low oxidation potential. I will present our group's effort to address these challenges using a new radical-based hybrid MBE approach. Using Stannate ($BaSnO_3$ and $SrSnO_3$) as a model material system, I will present a detailed growth study of epitaxial, phase-pure, stoichiometric $(Ba,Sr)SnO_3$ films using hexamethylditin, $(CH_3)_6Sn_2$ (HMDT) as a tin precursor, elemental solid source for Sr and Ba, and a rf plasma source for oxygen. Combined with a battery of structural characterization techniques, we will present a comprehensive electronic transport study of La-doped $BaSnO_3$ and $SrSnO_3$ and will discuss the important role of structural defects such as dislocations, and non-stoichiometry, and dopant concentration on electronic properties. We will also discuss different scattering mechanisms in La-doped $BaSnO_3$, which limits the room temperature electron mobility. Finally, we will present pathways to enhance electron mobilities towards high room temperature mobility oxide heterostructures using defect-managed thin films and interfaces.

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Bio

Bharat Jalan is an associate professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota, where he leads the Thin Films and Heterostructure Synthesis Group. His interests are in study of structure-defect-electronic properties relationships of functional oxide films and artificially designed structures. In 2016, he received the biennial International MBE Young Investigator Award and the AFOSR Young investigator award. More recently in 2017, he was awarded with the American Association for Crystal Growth Young Author Award and the AVS Paul Holloway Young Investigator Award. He was named an Emerging Young Investigator by the Royal Society of Chemistry (J. Mater. Chem. C, 2017). Jalan has (co)-authored more than 40 peer-reviewed publications and given more than 45 invited talks and colloquiums. He is a member of the APS, MRS, AVS, and ACerS, and has (co)-organized multiple symposia for these societies including multiple international meetings on the physics and chemistry of oxide thin films and heterostructures. He serves as an editorial board member of the Nature Scientific Reports journal. He had served as an invited member of the MRS task force for the strategic planning for the National Nanotechnology Initiative submitted to the White House.

Jalan received a BS degree in MSE from Indian Institute of Technology (IIT) Madras in India (2006) and a PhD degree in Materials Science from the University of California, Santa Barbara (2011). From 2011-2016, he was an assistant professor at the University of Minnesota, Twin Cities and was recently promoted to the associate professor.

https://research.cems.umn.edu/jalan/Jalan_research_group/Home.html

Hosted by Susanne Stemmer.