Abstract: NeSA202100oral-15: Novel Complex Oxide Growth Technique: hybrid Molecular Beam Epitaxy

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Presenter:

Suresh Thapa

Authors:

Suresh Thapa[1] and Ryan Comes[1]

[1]*Department of physics, Auburn University, Alabama, USA*

Novel Complex Oxide Growth Technique: hybrid Molecular Beam Epitaxy Suresh Thapa and Ryan Comes Auburn University Abstract: Experimental verifications is the key to validate the results from theory and simulation in the field of materials science. Materials science research has played a crucial role in technological advancement where atomic scale research has been normal nowadays. Computer simulations on theoretical model of materials demand immense care when it comes to the atomic scale. On the other hand, synthesis of those materials is super challenging despite rapid advancement in technology. It becomes almost impossible when it comes to the synthesis of perfect perovskite oxides and even more difficult to replicate the growth with same precision due to the lack of adsorption-controlled growth window. Synthesis of high-quality perovskite oxides is supplemented by pulse laser deposition and molecular beam epitaxy (MBE) since past three decades. Though the difficulties in dealing with transition metals having low vapor pressure and refractory metals gives rise to the hybrid MBE (hMBE) approach for material synthesis where metal organic precursor are used along with regular effusion cells. Since the last decade, hMBE has been established as a state of art technique in oxide thin film synthesis due to its ability to deliver refractory and low vapor pressure metals with ease. These days, reflection high energy electron diffraction (RHEED) is included in most of the hMBE system for in-situ monitoring of the growth. The availability of large varieties of characterization tools has sophisticated experimental materials research. Among all those tools, X-ray photoelectron spectroscopy (XPS) is handy in oxide thin film characterization due to its surface probing nature. The major advantage of XPS is its' ability to determine precise composition of constituent metals in the sample and oxidation state of metals. On the other hand, XPS is also well known for its capability of characterizing contaminants on the film or on the surface of the film.