

DEPARTMENT OF MATERIALS SCIENCE AND ENGINEERING

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PRESENTS:

Defect Engineered Complex Oxide Thin Films with Anomalous Multifunctionalities

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Abstract

Complex oxides have demonstrated various important physical properties such as various dielectric and unusual magnetic properties. These extraordinary phenomena are highly dependent upon the degrees of the freedom of the charge distribution, spin and orbital status, and the lattice structures. Among the perovskite cobalt oxide system, the complex cobalt oxide can exhibit different cobalt and oxygen coordination from tetrahedral, pyramidal to octahedral dependent on the oxygen contents, leading to various crystal structures with a great flexibility of the oxygen frameworks. Thus, oxygen nonstoichiometry becomes a very crucial parameter for tuning their atomic structure and physical properties. For instance, $\text{LnBaCo}_2\text{O}_{5+d}$ (LnBCO, Ln= rare transition metal elements) systems exhibit various unique physical properties not only due to the presence of A-site disordered and A-site ordered structures (the close ionic sizes of Ln and Ba), but also the degree of ordered oxygen vacancy structures. These defect engineered structures induce the formation of various double perovskite structures and the strong couplings of multifunctionalities from ferroelectricity, ferromagnetism, optic/magnetoelectric response in a single phase double perovskite thin films. These findings open a new avenue for material genetic design and synthesis by tailoring the atomic defect structures to facilitate the strong correlated multifunctionalities for novel device development. Details will be discussed in the talk.

Bio

Dr. C. L. Chen is currently the professor of physics at the Department of Physics and Astronomy in the University of Texas at San Antonio, the joint professor at the Texas Center for Superconductivity at the University of Houston (TcSUH), the “Thousand Talent Program - B” professor at Tsinghua University, and the fellow of the American Ceramics Society. He received his PhD degree in solid state science (Materials) and MS degree in Physics from the Pennsylvania State University in 1994, MS in Metallurgy Engineering from the Chinese Academy of Sciences (IMR, 1986), and BS in Physics from Huachiao University (1983). He was awarded as the Director’s Funded Post-doctoral Fellow in the Los Alamos National Laboratory before he became a faculty member at TcSUH in the University of Houston on May 1996. His research interests have spanned over the areas of multifunctional oxide thin film epitaxy, nanostructure fabrication, surface and interface physics and chemistry, and modeling developments. He has authored and/or coauthored near 200 refereed papers appeared in *Nature*, *Physical Review Letters*, *Applied Physics Letters*, *Nanoletters*, and others, and delivered more than 250 plenary/keynote lectures/invited talks at various international/national conferences, universities, and research institutes. He has served as several international advisory board members in various international conferences, chairs and/or co-chairs in

various international and national symposiums such as the American Ceramics Society, Materials Science and Engineering, and others. His researches have been supported by NSF, Department of Energy, the State of Texas, etc.



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