University of Texas at San Antonio

Department of Physics & Astronomy

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Time: 3:00 p.m.-4:00 p.m.

BB 3.04.18

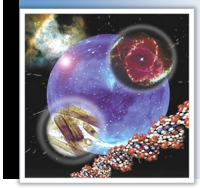
Teaching "Old" Materials "New" Tricks: Nanopatterning and Localized Properties of Multifunctional Oxides

The natural evolution of functional materials architecture calls for their *confinement* in *spatial* and *dimensional* modes. Here, *spatial confinement* refers to inevitable attachment of materials to a substrate or an overlayer, for example. *Dimensional* constraint arises from the emerging need for materials to be confined to 0- (i.e., nanocrystals), 1- (nanolines) and 2- (i.e., films/membranes) dimensions. Further, by juxtaposing two or more functional materials in close proximity, there are exciting new opportunities for *synergistic coupling* of disparate phenomena in such hybrid confined materials systems.

In this context, surface patterned nanoscale architecture offers unprecedented opportunities to revisit fundamental materials science phenomena – which flirt with thermodynamics of constrained systems on one hand and dynamics of nanoscale processes on the other. The presentation will cover synthesis and patterning of oxides down to nanoscale, with an emphasis on multifunctional phenomena. Advanced scanning probe, *in-situ* and *ex-situ* electron, ion and photon microscopy, spectroscopy and synchrotron x-ray scattering approaches are being employed to fathom the most intricate details of the internal "*microstructure*" of nanostructures, coupled with innovative tools to validate their functional identity and localized properties.

The presentation topics will range from soft-eBL nanopatterned ferromagnetics/ferroelectrics for investigating solid-state phenomena to SPM-probe based patterning and lithography of soft, hard and hybrid materials.

It will be argued that multifunctional nanostructures go beyond the "*hype*", and present challenging yet exciting opportunities for synthesis-structure-architecture-form-function-performance relationships in complex materials systems.



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