Probing Large Scale Phase Separation in Manganites by Means of Spatial Confinement

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Two hotly researched areas in condensed matter physics are complexity and nanoscale behaviors. Interestingly, these two areas have little overlap as most of the nanophysics research work is conducted using “simple” materials of metals or semiconductors instead of complex materials such as transition metal oxides (TMOs). However, due to the strong electronic correlation, it is exactly the transition metal oxides that will most likely lead to observations of striking new phenomena under spatial confinement. As an example, I will discuss our recent experimental findings on spatially confined $La_{5/8-x}Pr_xCa_{3/8}MnO_3$ (LPCMO). Ultra-sharp steps in resistivity and a never before seen reemergent metal-insulator transition in these devices shine new light on the processes at play in LPCMO and open the door to study other phase separated materials in a similar manner.