

MAR05-2004-001846

Abstract for an Invited Paper  
for the MAR05 Meeting of  
the American Physical Society

### **Multi-scale Phase Competition and Coexistence in Strongly Correlated Materials**

SHIGEO MORI, Department of Physics, Osaka Prefecture University

The intriguing interplay between charge/spin/lattice/orbital degrees of freedom gives rise to various competing phases as ground states in strongly correlated materials such as manganites. The delicate balance between these ground states leads to new metastable ground state which is characterized by the coexistence of phases with distinct electronic/magnetic ground state which is characterized by the coexistence of phases with electronic/magnetic properties such as the insulating charge ordered phase and the metallic ferromagnetic phase. The length scale of the phase separated system was found to vary from micrometer to nanometer in various manganites and under different situation. The CMR is closely related to the coexistence of the phase separated inhomogenities. Lattice strain apparently plays a very significant role affecting the length scale of these phase separated systems. Nanoscale phase separation is often observed at temperatures above the characteristic temperature associated with formation of each particular phase. For example, we have observed the formation of nano-scale ferromagnetic droplets in a well defined temperature window preceding the long-range ferromagnetic ordering. The complexity of the electronic phase separation in different length scales will be discussed. This work is now doing in collaboration with C.H.Chen, S-W.Cheong, T.Asaka, Y.Horibe, Y.Matsui, T.Katsufuji, M.Uehara, Y.Moritomo, H.Kuwahara and their team members.