Raman scattering studies of field- and temperature-dependent melting of charge order in $\text{La}_{0.25}\Pr_{0.375}\text{Ca}_{0.375}\text{MnO}_3$ and $\text{La}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$.

MINJUNG KIM, H. BARATH, S.L. COOPER, Dept. of Physics and Frederick Seitz Materials Research Laboratory, University of Illinois at UC, M. RUBHAUSEN, Institut fur Angewandte Physik, Univeristat Hamburg, Germany, S.W. CHEONG, Dept. of Physics and Astronomy, Rutgers University, New Brunswick, NJ — The $\text{La}_{0.25}\Pr_{0.375}\text{Ca}_{0.375}\text{MnO}_3$ system provides an interesting opportunity to study the effects of chemical disorder—introduced by replacing $\text{La}^{3+}$ with $\text{Pr}^{3+}$ having a smaller ionic radius—on the charge-ordered (CO) state and the complex field- and temperature-dependent phase behavior observed in the manganese perovskite $\text{La}_{1-x}\text{Ca}_x\text{MnO}_3$. We report field- and temperature-dependent Raman studies of $\text{La}_{0.25}\Pr_{0.375}\text{Ca}_{0.375}\text{MnO}_3$ and $\text{La}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$, in which we are able to carefully study the effects of disorder on both field-induced melting of CO and on the field-induced evolution of novel structural and magnetic phases in the (La,Pr,Ca)MnO$_3$ system. Among other results we will discuss, $\text{La}_{0.25}\Pr_{0.375}\text{Ca}_{0.375}\text{MnO}_3$ exhibits a quantum melting transition from a CO state to a ferromagnetic metal phase at fields less than 7 T, which is a much lower value than that observed in $\text{La}_{0.5}\text{Ca}_{0.5}\text{MnO}_3$ ($\sim$20T).

1Work supported by the Dept. of Energy under grant No. DEFG02-91ER45439

Minjung Kim
Dept. of Physics and Frederick Seitz Materials Research Laboratory,
University of Illinois at UC

Date submitted: 13 Dec 2006

Electronic form version 1.4