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Raman scattering studies of field- and temperature-dependent melting of charge order in $La_{0.25}Pr_{0.375}Ca_{0.375}MnO_3$ and $La_{0.5}Ca_{0.5}MnO_3$[1]

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The $La_{0.25}Pr_{0.375}Ca_{0.375}MnO_3$ system provides an interesting opportunity to study the effects of chemical disorder—introduced by replacing La^{3+} with 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 $La_{1-x}Ca_xMnO_3$. We report field- and temperature-dependent Raman studies of $La_{0.25}Pr_{0.375}Ca_{0.375}MnO_3$ and $La_{0.5}Ca_{0.5}MnO_3$, 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, $La_{0.25}Pr_{0.375}Ca_{0.375}MnO_3$ 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 $La_{0.5}Ca_{0.5}MnO_3$ ($\sim$20T).

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