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Microscopic driving force in electronic smectic-nematic transition in $La_{1/3}Ca_{2/3}MnO_3$ JING TAO, Condensed Matter Physics & Materials Science Department, Brookhaven National Laboratory, K. SUN, Department of Physics, University of Michigan, W.G. YIN, Condensed Matter Physics & Materials Science Department, Brookhaven National Laboratory, S.J. PENNYCOOK, Department of Materials Science and Engineering, University of Tennessee, J.M. TRANQUADA, Y. ZHU, Condensed Matter Physics & Materials Science Department, Brookhaven National Laboratory — Electronic liquid crystal (ELC) phases provide unique descriptions to characterize the electronic structures and elucidate the underlying physics in correlated materials from symmetry perspective. Although ELC phases have been proposed to play a key role in interpreting the structure-property relationship in a wide range of correlated materials, the experimental manifestations of the nature of the transition between such phases have been waiting to be explored. Using transmission electron microscopic tools with recently developed techniques, we studied the electronic smectic-nematic phase transition in $La_{1/3}Ca_{2/3}MnO_3$ by monitoring the evolution of charge ordering and orbital ordering superstructures as a function of temperature. We observed that the transition is driven by the formation of defects and electronic phase separation. In addition, we found that charge inhomogeneity is responsible for the electronic smectic-nematic phase transition in this material.

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