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Scanning Tunneling Spectroscopy Investigation of $La_{2-2x}Sr_{1+2x}Mn_2O_7$(x=0.32, 0.4) at Low Temperatures JUNWEI HUANG, JEEHOON KIM, ALEX DE LOZANNE, Department of Physics, University of Texas, J.-S. ZHOU, J. B. GOODENOUGH, Texas Materials Institute, University of Texas — We have investigated the surface electronic properties of the ferromagnetic Ruddlesden-Popper compounds $La_{2-2x}Sr_{1+2x}Mn_2O_7$ (x=0.32, 0.4) with our home-made ultra-high vacuum (UHV) and low-temperature scanning tunneling microscope at 20K and 80K. We found that the atomically flat surfaces of both compounds show nano-sized features that may be related to the formation of Mn(4+)-rich and Mn(3+)-rich clusters. The tunneling spectra on those clusters reveal that the local density of states (LDOS) of the Mn(4+)-rich clusters is quite different from those of the Mn(3+)-rich clusters. We also observed a gap that is temperature dependent and spatially inhomogeneous. These unique electronic properties may be explained by the collective polaron model, where the polaron clusters condense below the ferromagnetic transition temperature.

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