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The micro-twinning in $La_{1-x}Sr_xMnO_3$ (LSMO) epitaxial thin films on $SrTiO_3$ (001) LIFENG YIN, ZHENG GAI, THOMAS ZAC WARD, JIANXIN MA, DALI SUN, HANGWEN GUO, JOHN D. BUDAI, JIAN SHEN, Oak Ridge National Laboratory — We use variable-temperature scanning tunneling microscope to study the micro-twinning in $La_{1-x}Sr_xMnO_3$ (LSMO) epitaxial thin films grown on $SrTiO_3$ (001) substrates (STO). At room temperature, when the LSMO film thickness lager than 10 unit cell, micro-twinning patterns with long periodicity are formed, due to the shear strain between the rhombohedral LSMO film and the cubic perovskite STO substrate. Upon cooling, atomically flat regions start to appear at about 175 K and become dominant at 108 K. This morphological evolution is believed to be associated with the temperature driven structural transition of the STO substrate that leads to a shear strain relaxation in the LSMO films. During this transition, the twinned and un-twinned regions coexist and lead to large-scale spatially inhomogeneous distributions.

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