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Annealing effects on the structural changes of
 $\text{La}_{0.84}\text{Sr}_{0.16}\text{MnO}_{3-\delta}$ thin films

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The structural changes of $\text{La}_{0.84}\text{Sr}_{0.16}\text{MnO}_{3-\delta}$ (LSMO) thin films with different lattice strain are studied by *in-situ* synchrotron x-ray scattering during annealing. The LSMO (001) thin films are epitaxially grown on annealed SrTiO_3 (001) substrates, and then post-annealed at 700 °C in air. During the oxidation, the *c* lattice constants are discontinuously contracted as a function of annealing time, which is directly related to the ratio change of $\text{Mn}^{3+}/\text{Mn}^{4+}$. For fully strained thin LSMO film, the *a* lattice constant is unchanged despite the contraction of *c* lattice during the oxidation, which induces the structural modulation in the film plane. The relaxed LSMO film, however, becomes cubic-like similar to that of the bulk.