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Temperature Dependent Strain Relaxation in $LaAlO_3$ Thin Films on $SrTiO_3$ Substrates GUOZHEN LIU, KE CHEN, QINGYU LEI, Department of Physics, Temple University, QUN LI, LONGQING CHEN, Department of Materials Science and Engineering, Penn State University, XIAOXING XI, Department of Physics, Temple University — $LaAlO_3/SrTiO_3$ interface has attracted great interest due to discoveries of rich interfacial properties. Strain and strain relaxation in $LaAlO_3$ films on $SrTiO_3$ substrates directly impact the lattice distortions and defects at the interface and therefore will influence the interfacial properties. Combining grazing incident x-ray diffraction and reciprocal space mapping, we directly measured the in-plane lattice constants of $LaAlO_3$ films on $SrTiO_3$ with thickness ranging from 4 u.c. to 250 u.c. We found a strong relationship between the strain relaxation behavior and the growth temperature of the $LaAlO_3$ films. Cracks were observed when the strain relaxed rapidly, consistent with the fracture theory. The processing temperature-dependent strain relaxation significantly affects the $LaAlO_3/SrTiO_3$ interface properties.

Guozhen Liu
Department of Physics, Temple University

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