In this study, we investigate the residual stress of Sr-doped LaTiO$_3$ (SrxLa$_{1-x}$TiO$_3$, $x = 0.16, 0.49, 0.69$ and $0.84$) thin films grown on LaAlO$_3$ (001) substrate by X-ray diffraction method. In the experiments, firstly, we used the X-ray $\theta$-2$\theta$ scan to analyze the crystal structure and the growth direction of the films. We found the films are epitaxial and the c-axis of films is perpendicular to substrate plane. The X-ray $\theta$ scans were taken to verify in-plane arrangement of the films, and the data show the films are well fourfold symmetric. The X-ray asymmetry scan were studied to investigate the sin$^2\theta$ dependence of strain. We found the residual stress of SrxLa$_{1-x}$TiO$_3$ thin films which depend on $x$ are correlated to the electrical transport properties.

Keywords : SrxLa$_{1-x}$TiO$_3$, residual stress, transport properties