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Formation of highly-conductive $\text{SrTiO}_{3-\delta}$ by pulsed laser deposition of TiO_2 on SrTiO_3 substrate KUNITADA HATABAYASHI, Department of Chemistry, University of Tokyo, TARO HITOSUGI, Department of Chemistry, University of Tokyo / Kanagawa Academy of Science and Technology (KAST), YUTAKA FURUBAYASHI, YASUSHI HIROSE, Kanagawa Academy of Science and Technology (KAST), TOSHIHIRO SHIMADA, TETSUYA HASEGAWA, Department of Chemistry, University of Tokyo / Kanagawa Academy of Science and Technology (KAST) — We report on formation of highly conductive $\text{SrTiO}_{3-\delta}$ by pulsed laser deposition of TiO_2 on SrTiO_3 substrate under relatively reducing atmosphere. Anatase TiO_2 thin films were grown on $\text{SrTiO}_3(001)$ and $(\text{LaAlO}_3)_{0.3}(\text{Sr}_2\text{AlTaO}_6)_{0.7}$ (LSAT)(001), for comparison, by pulsed laser deposition under oxygen pressure of $P_{\text{O}_2} = 5 \times 10^{-8}$ Torr. In-situ RHEED (reflection high energy electron diffraction) measurements during film deposition revealed a clear streak pattern of 4×1 reconstruction, indicating growth of high quality anatase (001) films. Meanwhile, the anatase (001) films deposited on LSAT with thickness of >2 nm showed spotty RHEED patterns, indicating formation of oxygen-poor TiO_{2-x} . These facts lead us to a conclusion that oxygen atoms in SrTiO_3 substrate diffuse into anatase TiO_2 during the film growth process. In the $\text{TiO}_2/\text{SrTiO}_{3-\delta}$ heterostructure, we observed high mobility of 1×10^4 cm^2/Vs (5K) and Shubnikov-de Haas oscillation (0.5K), proving formation of clean $\text{SrTiO}_{3-\delta}$ without structural deformation.

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